
A REVISION OF THE GENUS *PITHECOCTENIUM* (BIGNONIACEAE)^{1,2}

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ABSTRACT

Pithecoctenium Mart. ex Meisn. is a genus of four species in the tribe Bignoniaceae. All the species are lianas, and can be recognized by their acutely hexangular branchlets, bifoliolate leaves with a trifid or, more frequently, additionally trifurcately-branched terminal tendril, arching corollas that are coriaceous, white, and pubescent, and echinate fruits (except in *P. falcatum* (Vell.) A. Pool) with seeds surrounded on three sides by a clearly demarked, hyaline-membranous wing. Relationships with similar genera are discussed, and a key to the species of *Pithecoctenium*, their descriptions, and distribution maps are provided. The relationships of the species are also discussed. Lectotypes are designated for *Bignonia squalus* Vell., *P. echinatum* var. *tomentosum* Hassl., *P. vitalba* f. *glabratum* Hassl., and *P. vitalba* f. *intermedium* Hassl., a lectotype and epitype are designated for *B. falcata* Vell., and a new combination, *P. falcatum* (Vell.) A. Pool, is proposed. The following are presented as new synonyms of *P. crucigerum* (L.) A. H. Gentry: *B. botryoides* Cham., *B. vitalba* Cham., *B. vitalba* var. *extratropica* Cham., *P. catharinae* DC., *P. echinatum* var. *tomentosum* Hassl., *P. echinatum* var. *tomentosum* f. *grandiflorum* Hassl., *P. hexagonum* var. *brasilianum* DC., *P. vitalba* f. *glabratum* Hassl., *P. vitalba* f. *intermedium* Hassl., and *P. echinatum* var. *intermedium* Hassl. *Pithecoctenium cynanchoides* DC., *Anemopaegma clematideum* Griseb., and *P. cynanchoides* var. *pellucidum* Hassl. are presented as new synonyms of *P. carolinae* (Lindl.) G. Nicholson. *Pithecoctenium cordifolium* DC. (including the nomina nova for *P. cordifolium* DC.; *Neves-armondia cordifolia* K. Schum. and *P. hatschbachii* A. H. Gentry) is presented as a new synonym of *P. falcatum* (Vell.) A. Pool.

Key words: Bignoniaceae, Pithecocteniinae, *Pithecoctenium*.

Pithecoctenium Mart. ex Meisn. is a small Neotropical genus of four species in the tribe Bignoniaceae that has a number of vegetative, floral, and fruiting characters that make it fairly easy to recognize. As most members of the tribe Bignoniaceae, *Pithecoctenium* is a genus of lianas that has compound leaves with the terminal leaflet modified into a tendril, bilocular ovaries, and fruits with dehiscence parallel to the septum (Gentry, 1980). *Pithecoctenium* has branchlets without interpetiolar glandular fields, which are distinctly and acutely 6-angled with the ribs on the angles usually detaching with age, and leaves that are bifoliolate with a terminal tendril that is trifid or, more frequently, additionally branched. The calyx is truncate with the ribs extending apically to form five small, sometimes inconspicuous, denticles; the calyx and corolla are both very coriaceous, the corolla especially so at its glabrous base, above the base it is densely pubescent and the tube is generally bent at a right angle at a point 1/3 to 1/2 its length from the base. The ovary sits on a large nectary disc and is

covered with dense thick trichomes, except in *P. falcatum* (Vell.) A. Pool, which is lepidote. The capsule is thick, somewhat compressed, oblong-elliptic, woody, and usually densely echinate or muricate (smooth in *P. falcatum*). The seeds have a large wing that surrounds the seed body on three sides, and to varying degrees on the side of attachment, and is shiny, hyaline-membranous, and primarily white or colorless.

Melchior (1927) treated *Pithecoctenium* in his subtribe Pithecocteniinae (in tribe Bignoniaceae, Bignoniaceae), which also included *Distictella* Kuntze, *Neves-armondia* K. Schum. [referred to *Pithecoctenium*, *P. falcatum* (Vell.) A. Pool], *Urbanolophium* Melch. [= *Haplolophium* Cham., fide Gentry, 1992], *Haplolophium* Cham., *Glaziovina* Benth. & Hook. f., and *Amphilophium* Kunth. The subtribe was described as having bifoliolate or trifoliolate leaves, tendrils usually trifid (rarely bifid), or additionally forked, and often with disk-like tips, the calyx thickly coriaceous and densely tomentose, with or without defined lobes,

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the corolla coriaceous, and except in *Amphilophium*, densely pubescent, often curved at a right angle and sometimes more or less bilabiate, and the capsule oblong-elliptic, flattened, the surface smooth or rough to echinate, and the seed with a membranous wing.

Amphilophium and most species of *Haplolophium* have branchlets that are acutely hexangular as in *Pithecoctenium*; however, they can be separated vegetatively from *Pithecoctenium* by their tendrils that are never more than 3-branched and by the presence of at least some branched trichomes (not found in *Pithecoctenium*). Both have calyces with expanded, frilly margins, quite different from that found in *Pithecoctenium*, and *Amphilophium* has a strongly bilabiate pseudo-cleistogamous corolla versus the weakly zygomorphic, open corollas of *Pithecoctenium*. The monotypic genus *Glaziovina* has a terete stem and flowers similar to those of *Amphilophium*. *Distictella* has flowers very similar to those of *Pithecoctenium*, very coriaceous, white, densely pubescent and strongly curved; however, its branchlets are terete and unribbed and the tendrils not more than 3-branched. Fruits and seeds have not been seen for all of the species in all the genera of Melchior's subtribe Pithecocteniinae; however, all examined materials have fruits that are woody, relatively broad, oblong-elliptic or elliptic, and biconvex to somewhat compressed or, in *Distictella*, often strongly curved with one convex and one concave surface. The valve surface is smooth to slightly roughened in *Distictella* and *Glaziovina* but can be smooth to tuberculate in *Amphilophium* and smooth to echinate in *Haplolophium*. The seeds of the non-*Pithecoctenium* species are more strongly transversely oblong, with the thickened zone surrounding the body extending nearly to the wing tips and thus appearing more bialate, that is, as a seed with two lateral wings. The wings are also darker and less clearly demarcated from the seed body. Melchior (1927) provided a key to the genera in the subtribe Pithecocteniinae; however, many new species have been described (Sandwith, 1954a, 1957; Gentry, 1978, 1992; etc.) and generic concepts have changed (Gentry, 1992). Nonetheless, within the Pithecocteniinae, *Pithecoctenium* seems most closely related to *Distictella* as suggested by Melchior's key.

Distictis Mart. ex Meisn., *Ceratophytum* Pittier, and *Clytostoma* Miers ex Bureau, genera not included in Melchior's subtribe, Pithecocteniinae, also share characteristics with *Pithecoctenium*. *Distictis* is the most similar to *Pithecoctenium*; flowering and vegetative specimens of *Distictis* are sometimes misidentified as *Pithecoctenium*, and many species of *Distictis*, for which fruits were not known, were originally

described as *Pithecoctenium* (for example: *P. buccinatorium* DC. = *D. buccinatoria* (DC.) A. H. Gentry, *P. stipulare* Mart. ex DC. = *D. stipularis* (Mart. ex DC.) A. H. Gentry, *P. laxiflorum* DC. = *D. laxiflora* (DC.) Greenm., *P. scabriusculum* Mart. ex DC. = *D. scabriuscula* (Mart. ex DC.) A. H. Gentry). *Distictis* is similar to *Pithecoctenium* in having branchlets that are hexangular and ribbed, though usually less conspicuously so (but sometimes with the ribs detaching with age), and in having trifid (or sometimes more branched) tendrils. The flowers are white as in *Pithecoctenium* or purple, orange, or red, and the calyx is of similar shape and texture as that found in *Pithecoctenium*, but the corolla, while of the same general shape and pubescence, has a more or less straight tube and is of a somewhat more delicate texture. The fruit, like that of *Pithecoctenium*, is elliptic-oblong and woody, but is pointed at both ends, and the valves are never echinate or tuberculate. The seeds in some of the species approach those of *Pithecoctenium* in shape, and often have the wing well demarcated from the seed body, but the surface of the body is irregularly ridged. Based on these numerous vegetative, floral, and seed similarities, the relationship between these two genera should be further explored.

Ceratophytum has flowers that are very similar to those of *Pithecoctenium*, but is very different in many other aspects, such as terete branchlets with very conspicuous interpetiolar glandular fields, fruits oblong-linear and subtetragonal, and seeds bialate with the wings brown and not clearly demarcated from the seed body.

Fruiting specimens of *Clytostoma* are sometimes confused with *Pithecoctenium*. However, the echinate fruits of *Clytostoma* develop from ovaries that are covered with blunt, glandular projections while the echinate fruits of *Pithecoctenium* develop from ovaries that are densely sericeous with thick appressed trichomes. The fruiting projections of *Clytostoma* are curved while they are straight in *Pithecoctenium*, and the seeds of *Clytostoma* are thick, corky, and nearly wingless, or essentially winged on only one side. Gentry (1973a) described the resemblance of the fruit of the two genera as superficial, and suggested that the echinate projections evolved independently as a mechanism for protecting developing fruits and seeds from monkey predation.

Bureau and Schumann (1896) treated *Pithecoctenium falcatum* (under the illegitimate name, *P. cordifolium* DC.) in its own section, *Leiogyne*, within the genus *Pithecoctenium*, based on its glabrous (but lepidote) ovary and pellucid-punctate leaflets. The leaflets are actually pellucid-lepidote, a common characteristic in the genus *Pithecoctenium*. Schumann

(1897), after receiving a fruiting specimen of *P. falcatum*, published the new monotypic genus, *Neves-armondia*, and new combination *N. cordifolia* K. Schum., separating it from *Pithecoctenium* based on its non-pubescent ovary and smooth fruit. Melchior (1927) used these same characters (plus the pellucid-punctate leaflets) to separate *Neves-armondia* from *Pithecoctenium*. Gentry (1979) returned *N. cordifolia* to *Pithecoctenium* (as *P. hatschbachii* A. H. Gentry = *P. falcatum*) based on similar flower (excluding the glabrous ovary of *Neves-armondia*) and vegetative characters and identical pollen type (Gentry & Tomb, 1979). This placement is followed here and is further supported by the capsule of *P. falcatum*, which in its overall appearance, except for the surface, is similar to that of *P. crucigerum* (L.) A. H. Gentry, and by its seeds, which are also very similar. Furthermore, as both smooth and echinate or tuberculate fruits are found within the same genus in other genera in the Pithecocteniinae (*Amphilophium* and *Haplolophium*), this difference does not seem worthy of generic recognition.

HISTORY

Meisner established the genus *Pithecoctenium* in 1840, crediting Martius with the generic name. He made no new combinations but referred to de Candolle's unpublished *Prodromus* treatment (21 species), and cited published plates of *Bignonia echinata* Jacq. and *B. squalus* Vell., and text pages of *B. vitalba* Cham. and *B. botryoides* Cham. *Pithecoctenium echinatum* (Jacq.) Baill. (as K. Schum.) was later selected as the lectotype by Sandwith (1962).

Martius (1841) published the first combination in *Pithecoctenium*, *P. cordifolium* Mart., unfortunately an illegitimate name due to the citing of *Bignonia squalus* in synonymy. De Candolle (1845) recognized 21 species in his treatment of *Pithecoctenium* for the *Prodromus*, 17 as new species, three as new combinations, and one previously published by Splitgerber. Of these, 10 are still considered to be *Pithecoctenium*, with eight treated here as synonyms of *P. crucigerum*, six treated as *Distictis*, two as *Distictella*, and one each as *Arrabidaea* DC., *Clytostoma*, and *Paragonia* Bureau. Klotzsch (1848) published two new names (without diagnosis) and one new combination in *Pithecoctenium*. Miers (1863) recognized a relationship between *Haplolophium* and *Pithecoctenium* and suggested that *P. elongatum* (Vahl) Klotzsch (now treated within *Distictella*; Gentry, 1982a) belongs to neither of these genera, and published a new genus *Phaedranthus* Miers for *P. buccinatorium* (now treated within *Distictis*; Gentry, 1973a). Miers (1863: 183) also noted that "It will

probably be found that some other Mexican species of *Pithecoctenium* enumerated by de Candolle, especially those with purple flowers and a 3-fid cirrhus, belong to this genus." Bureau, in his monograph of the family (1864), gave the first indication of a relationship between *Distictis* (as *Macrodiscus* Bureau) and *Pithecoctenium*.

Schumann (1894) published the new species *Pithecoctenium glaziovii* Bureau ex K. Schum. (now treated within *Haplolophium*; Gentry, 1992) and two combinations, *P. dolichoides* (Cham.) Bureau ex K. Schum. and *P. echinatum* (Jacq.) K. Schum. (although the latter had been made earlier by Baillon [1891], it is the Schumann publication that is most frequently cited, with the name incorrectly ascribed to Schumann), and in his key to genera placed *Pithecoctenium* in a trichotomy with *Haplolophium* and *Distictella* (as *Distictis* sensu Bureau), suggesting a relationship among the three. Bureau and Schumann (1896) placed many of de Candolle's names in the synonymy of *P. vitalba* (Cham.) DC. and *P. echinatum*, treated the three *Pithecoctenium* species of Klotzsch as *Distictis* sensu Bureau [= *Distictella*], moved other de Candolle species of *Pithecoctenium* to other genera, and recognized a new section in *Pithecoctenium*. Their treatment of the genus is very close to that followed here. They noted that *P. scabriusculum* Mart. ex DC. and *P. stipulare* Mart. ex DC. (both now treated as *Distictis*) were retained in *Pithecoctenium* with doubt, and that *P. echinatum*, *P. vitalba*, and *P. botryoides* (Cham.) DC. might all be one species. If *P. scabriusculum* and *P. stipulare* are removed from their treatment, *P. echinatum*, *P. vitalba*, and *P. botryoides* are all treated as one species (under the name *P. crucigerum*), and *P. cordifolium* DC. (a later homonym of *P. cordifolium* Mart.) is treated as *P. falcatum*, then there is little difference between the two treatments.

In 1897, Schumann established the monotypic genus *Neves-armondia*, with a single species, *N. cordifolia*, for *Pithecoctenium cordifolium* DC., based on its glabrous ovary and smooth fruit. Gentry (1979) moved this species back to *Pithecoctenium* under the new name *P. hatschbachii*. In this paper, it is treated as synonymous with *P. falcatum*.

Hassler (1910) recognized the variation in the now accepted *Pithecoctenium crucigerum* by providing a key to separate *P. echinatum* and *P. vitalba* and publishing a number of infraspecies in both. Melchior (1927) published the subtribe Pithecocteniinae and provided descriptions of, and a key to, the genera.

In 1975, Gentry (1975a) lectotypified *Bignonia crucigerum* L. and published *Pithecoctenium crucigerum* (L.) A. H. Gentry, the oldest name for what was

known as *P. echinatum* (including *P. vitalba*, etc.). In most modern Neotropical floras prior to 1975 (*Flora of Suriname*, Sandwith, 1938; *Flora of Trinidad and Tobago*, Sandwith, 1954b; *Flora of Peru*, Macbride, 1961; *Flora Argentina*, Fabris, 1965; *Flowering Plants of Jamaica*, Adams, 1972; *Flora of Panama*, Gentry, 1973b; *Flora Ilustrada Catarinense*, Sandwith & Hunt, 1974; *Flora of Guatemala*, Standley & Williams, 1974), this species is referred to as *P. echinatum*. Recent authors (Sandwith, 1937, 1938, 1954a; Fabris, 1965; Gentry, 1973a, 1973b, 1974, 1979, 1982a; Sandwith & Hunt, 1974; Barrie, 1991) have selected a number of lectotypes and placed numerous names in synonymy.

ANATOMY

Santos (1995) studied 31 genera of Bignoniaceae and divided them into four groups based on the type of cambial variant present. Two species of *Pithecoctenium*, *P. crucigerum* and *P. dolichoides*, were included in her study. *Pithecoctenium* falls into her Group 4, which is characterized by stems with discontinuous phloem wedges intersected with xylem and parenchyma (Santos, 1995). The only other genus in this group is *Distictella*. *Pithecoctenium* differs from *Distictella* (and the other genera studied) by having secondary xylem in the bark (Santos, 1995). Two other genera in the Pithecocteniinae, *Amphilophium* and *Haplolophium*, as well as *Distictis* (among a number of other genera) fell into her Group 2, having stems with multiples of four phloem wedges in transverse section. The remaining genus in Pithecocteniinae, *Glaziovina*, was not included in her study.

PALYNOLOGY

Pithecoctenium (represented by *P. crucigerum* and *P. falcatum*, as *P. hatschbachii*) has inaperturate, coarse-reticulate pollen (Gentry & Tomb, 1979: fig. 54). This pollen type was found in a number of other genera within the Bignoniaceae, which Gentry and Tomb (1979) suggested could be divided into two natural groups. The one including *Pithecoctenium* is characterized by having thick-textured white to purple or red flowers, trifid to multi-trifid tendrils, and multiseriate ovules and seeds. The other genera in the group are *Distictis* and *Distictella*. Members of the other group have medium-textured, yellow (rarely white or orange) flowers, simple tendrils, and mostly biseriate ovules and seeds; this group includes *Adenocalymma* Mart. ex Meisn., most species of *Memora* Miers, and two species of *Tanaecium* Sw. The other genera in the Pithecocteniinae (*Amphilophium*, *Glaziovina*, and *Haplolophium* [including *Urba-*

nolophium]) all had pollen of the same type: stephanocolpate (zonocolpate) with coarse reticulation (Gentry & Tomb, 1979: figs. 7, 8). This difference in pollen type, in addition to the calyx simple versus with a frilled margin, was used by Melchior (1927) as the first division in his key to genera of Pithecocteniinae to separate *Distictella* and *Pithecoctenium* (including *Neves-armondia*) from the other genera.

DISTRIBUTION

Pithecoctenium is primarily a Neotropical genus, ranging from the Tropic of Cancer in Mexico to northern subtropical South America. *Pithecoctenium crucigerum* (Fig. 1A) ranges from the Tropic of Cancer in Mexico throughout Central America and into western South America through Peru and Bolivia to northern Argentina, into eastern South America through both Amazonian and Atlantic Brazil to Paraguay, northern Argentina, and Uruguay, and is also found in Cuba, Jamaica, and Trinidad, at 0–1900 m elevation, in any disturbed habitat. It is reported to naturalize in southern Florida (Fisher s.n., FTG). Gentry (1973b) regards this as both geographically and ecologically one of the most wide-ranging species of Bignoniaceae. *Pithecoctenium carolinae* (Lindl.) G. Nicholson (Fig. 1B) is found in southeastern Bolivia, western Uruguay, northwestern Paraguay, and northern Argentina, at 50–1500 m elevation. It is generally reported to be found in dry forests, thorn scrub, or pasture. *Pithecoctenium dolichoides* (Fig. 1B) and *P. falcatum* (Fig. 1C) are from Atlantic Brazil, with one collection of *P. falcatum* from Bolivia. *Pithecoctenium dolichoides* is found below 1000 m elevation (and the habitat has not been described), and *P. falcatum* is found below 500 m, in disturbed areas.

ECONOMIC USES

Species of *Pithecoctenium* are reportedly cultivated as ornamentals for their attractive flowers and interesting fruits. I have seen no report of *P. falcatum* being cultivated, and the use of *P. dolichoides* is probably restricted to Brazil (F. C. Hoehne 33259, NY). *Pithecoctenium crucigerum* and *P. carolinae* are cultivated sparingly in the southern United States (Menninger, 1970) (N. F. Bracelin 1430 [L], J. B. McFarlin 5192 [MICH], respectively); cultivated specimens of both have been seen from southern tropical Africa (H. M. Biegel 3423a [MO], H. M. Biegel 5529 [MO], respectively), and cultivated specimens of *P. crucigerum* have been seen from the Canary Islands (G. Kunkel 11006, G). *Pithecoctenium carolinae* is reportedly cultivated in Java (van Steenis, 1977).

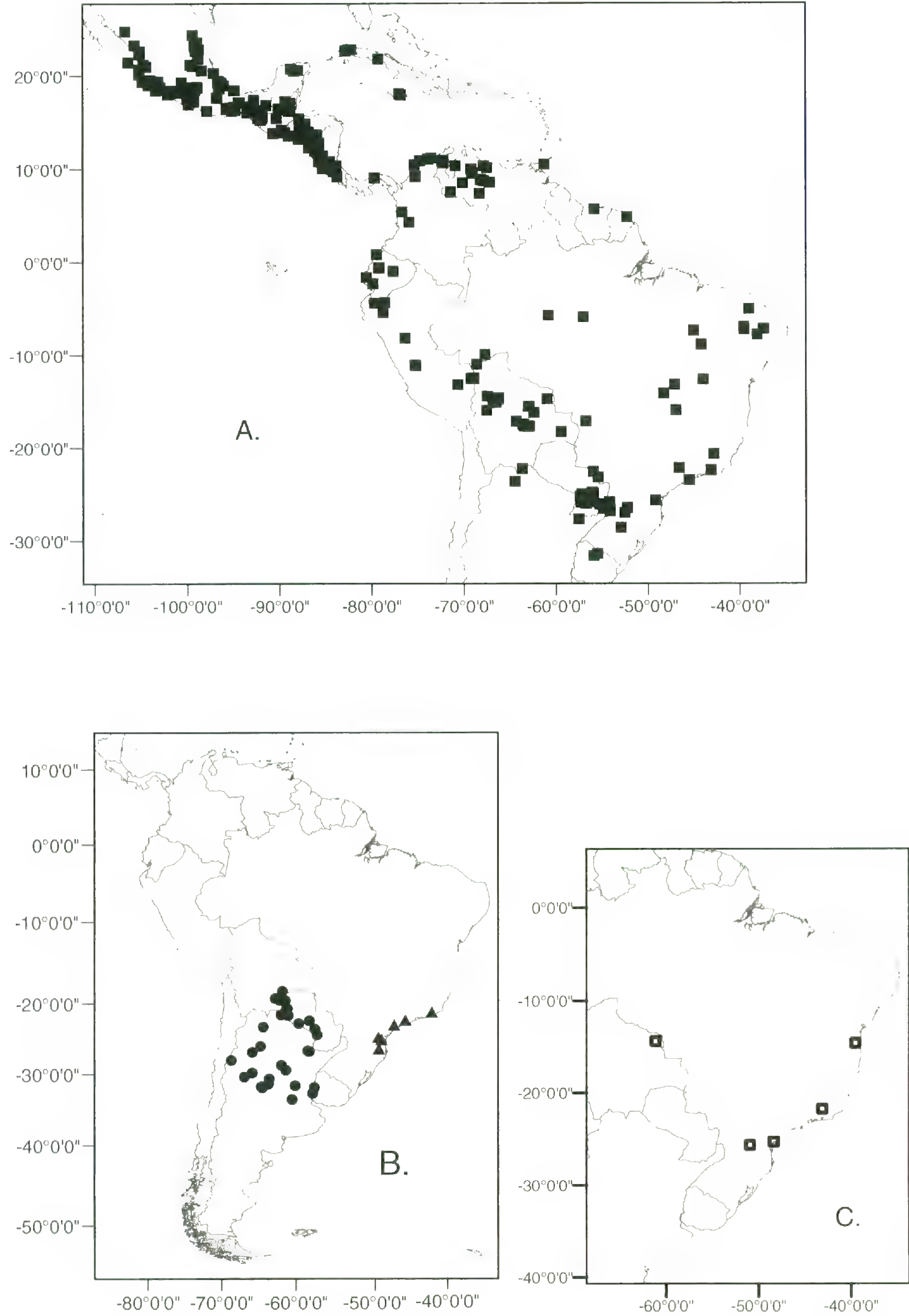


Figure 1. Distribution of *Pithecoctenium*, excluding cultivated and probably naturalized specimens. —A. *P. crucigerum* (L.) A. H. Gentry (■). —B. *P. carolinae* (Lindl.) G. Nicholson (●) and *P. dolichoides* (Cham.) Bureau ex K. Schum. (▲). —C. *P. falcatum* (Vell.) A. Pool (□). Dots on the map represent a subset of the specimens examined by this author, including specimens with geographic coordinates provided on the collection labels and a set of specimens selected to illustrate the full geographic range for each species, for which the author estimated the geographic coordinates.

MATERIALS AND METHODS

All specimens examined by Gentry and as part of this study have been incorporated into the Missouri Botanical Garden database-management system TROPICOS (<http://mobot.mobot.org/W3T/Search/vast.html>), which now contains label information for all *Pithecoctenium* specimens housed at MO in addition to those received on loan from AAU, B, BM, BR, C, CAS, CGE, CM, F, FTG, G, GH, GOET, L, M, MICH, NY, S, TEX, U, UPS, US, and W. Specimens determined by this author were selected from this database to generate the Index to numbered exsiccatae (Appendix I) and the distribution maps, the latter with the assistance of Duan Bills. Dots on the maps (Fig. 1) represent a subset of the specimens examined by this author, including specimens with geographic coordinates provided on collection labels and a set of specimens, for which the author estimated the geographic coordinates, selected to illustrate the full geographic range for each species.

TAXONOMIC TREATMENT

Pithecoctenium Mart. ex Meisn., Pl. Vasc. Gen. 1: 300, 2: 208. 1840. TYPE: *Pithecoctenium echinatum* (Jacq.) Baill. [Based on *Bignonia echinata* Jacq.] (lectotype, designated by Sandwith, 1962: 454).

Neves-armondia K. Schum. in Engl., Nat. Pflanzenfam. Nachtr. 1: 301, 302. 1897. TYPE: *Neves-armondia cordifolia* K. Schum.

Lianas; branchlets acutely hexagonal with detachable ribs, without interpetiolar glandular fields; pseudostipules caducous. Leaves 2(3)-foliolate, if 2-foliolate usually with a tendril; tendril terminal, filiform, apically trifid with each branch usually additionally divided numerous times, some of the tips frequently thickened and disk-like. Inflorescence a raceme or racemose panicle; bracteoles inconspicuous, attached along length of pedicel, caducous. Flowers with the calyx campanulate, coriaceous, truncate, the ribs extending apically to form 5 small denticles, these sometimes inconspicuous; corolla tubular-campanulate, coriaceous, white, externally densely tomentose or sericeous above the tubular, particularly thickened, glabrous base, tube often bent at a right angle at a point 1/3 to 1/2 length above base, internally glabrous except for ridge where stamens and staminode are adnate; lobes broad, imbricate, internally tomentose; stamens 4, included, anthers glabrous, dithecal, the thecae straight, divaricate, staminode present, small; disc annular-pulvinate; ovary broadly elliptic or oblong, constricted above the disc, usually densely pubescent with appressed

trichomes (glabrous in *P. falcatum*), bilocular, ovules multiseriate in each locule, style generally glabrous above base, stigma included, broadly ovate or rhombate. Capsule thick, somewhat compressed, oblong-elliptic, woody, the valves parallel to the septum, usually densely echinate or muricate (smooth in *P. falcatum*), the midrib not apparent; seeds in 2 or 3(4) rows, seeds with wing surrounding body on three sides and to varying degrees on side of attachment, wing shiny, hyaline-membranous, white or colorless with fine yellowish brown veins radiating from firmer zone around embryo, surrounding zone and embryo yellowish tan, smooth, minutely puberulent or papillose-puberulent.

When Meisner (1840) published the genus *Pithecoctenium*, he made no new combinations, but referred to de Candolle's unpublished *Prodromus* treatment (21 species) and cited published plates of *Bignonia echinata* Jacq. and *B. squalus* Vell. and text pages of *B. vitalba* Cham. and *B. botryoides* Cham. Martius (1841) published the first name in *Pithecoctenium*, *P. cordifolium* Mart., but made this name superfluous and illegitimate by citing *B. squalus* in synonymy. Sandwith (1962) treated *B. squalus* as synonym of *P. echinatum* (Jacq.) Baill. (based on *B. echinata* Jacq.) and chose this as the lectotype of the genus, stating "This is the most common, widely distributed and variable species of the genus, as well as the earliest named, and clearly it should be the lectotype, as I now propose" (Sandwith, 1962: 454). An earlier name for *P. echinatum* became available when Gentry (1975a) and Barrie (1991) lectotypified *B. crucigera* L. (1753), and the lectotype of the genus, *P. echinatum*, is treated here as a synonym of *P. crucigerum* (L.) A. H. Gentry.

Schumann (1897) published the monotypic genus, *Neves-armondia*, separating it from *Pithecoctenium* based on its glabrous ovary and smooth fruit. Melchior (1927) used these same characters to separate *Neves-armondia* from *Pithecoctenium*. Gentry (1979) returned *N. cordifolia* to *Pithecoctenium* (as *P. hatschbachii*) based on similar flower (excluding the glabrous ovary of *Neves-armondia*) and vegetative characters and identical pollen type (Gentry & Tomb, 1979). This placement is followed here and is further supported by the capsule of *N. cordifolia* [*P. falcatum*], which, in its overall appearance, except for the surface, is similar to that of *P. crucigerum*, and by its seeds, which are also very similar. Furthermore, as both smooth and echinate or tuberculate fruits are found within the same genus in other genera in the Pithecocteniinae (*Amphilophium* and *Haplolophium*), this difference does not seem worthy of generic recognition.

KEY TO SPECIES OF *PITHECOCTENIUM*

1. Ovary glabrous; fruit smooth or with very few dull tubercles; inflorescence usually a racemose panicle, or less frequently a raceme; 10–15 mm at base of seed free from seed wing; Brazil and Bolivia 4. *P. falcatum*

1'. Ovary densely sericeous; fruit distinctly muricate or echinate; inflorescence a raceme or rarely a racemose panicle; up to 8 mm at base of seed free from seed wing 2

2. Branchlets, inflorescences, and leaves villous with dense golden trichomes over 1.5 mm long; corolla 6.2–7 cm long, filaments of longer stamens 27–35 mm long; endemic to southern Atlantic Brazil 3. *P. dolichoides*

2'. Branchlets, inflorescences, and leaves variously puberulent, tomentose, pilose or glabrous, trichomes, when present, white, less than 1 mm long; corolla 2.5–6.8 cm long; filaments of longer stamens 12–25 (rarely 28) mm long; widely distributed in Neotropics 3

3. Leaflets ovate to suborbicular with acute or briefly acuminate apices; capsules 8–31.5 cm long, 1.5–4.5 cm in diam., wall 1.5–1.5 mm thick, spines 1–7 mm long; 3–8 mm at base of seed free from seed wing; filaments of longer stamens 15–25 (rarely 28) mm long; Mexico to northern Argentina 1. *P. crucigerum*

3'. Leaflets deltate with long-acuminate or long-caudate apices; capsules 4–13.5 cm long, 0.2–0.8 cm in diam., wall up to 1.5 mm thick, tubercles up to 1 mm long; up to 1.5 mm at base of seed free from seed wing; filaments of longer stamens 12–16 mm long; Bolivia, Uruguay, Paraguay, and Argentina 2. *P. caroliniae*

1. ***Pithecoctenium crucigerum*** (L.) A. H. Gentry. Taxon 24: 123. 1975. *Bignonia crucigera* L., Sp. Pl. 624. 1753. TYPE: Pt. 3, section 15, t. 3, f. 16 “PseudoApocynum folliculis maximis obtusis” in Morison, Pl. Hist. Univ. 1699 (lectotype, designated by Barrie, 1991: 265, t. 3, f. 16 “PseudoApocynum folliculis maximis obtusis” in Morison, 1699!).

Bignonia echinata Jacq., Enum. Syst. Pl. 25. 1760. *Pithecoctenium echinatum* (Jacq.) Baill., Hist. Pl. 10: 8. 37. 1891 [1888]. *Pithecoctenium echinatum* (Jacq.) K. Schum. in Engl., Nat. Pflanzenfam. 4(3b): 218. 1894, nom. illeg. TYPE: tab. 176, f. 52 in Jacq., Select. Stirp. Amer. Hist. 1763 (neotype, designated by Sandwith & Hunt, 1974: 154, tab. 76, f. 52 in Jacq., 1763!).

Bignonia tiliifolia Kunth in HBK, Nov. Gen. Sp. 3: 136. 1818 [1819] [as *tiliaefolia*]. TYPE: Venezuela. Orinoco [?], s.d., *F. Humboldt* & *A. Bonpland* s.n. (holotype, P not seen, photo F neg. 39417!).

Bignonia squalus Vell., Fl. Flumin. 244. 1825 [1829]. *Pithecoctenium squalus* (Vell.) DC. in A. DC., Prodr. 9: 194. 1845. *Pithecoctenium cordifolium* Mart., Flora 24(2, Beibl. 3): 48. 1841, nom. illeg. TYPE: tab. 13 in Vell., Fl. Flumin. Icones 6. 1827 [1831] (lectotype, designated here, tab. 13 in Vell., 1827 [1831]!).

Bignonia vitalba Cham., Linnaea 7: 699. 1832 [1833]. Syn. nov. *Bignonia vitalba* var. *aequinoctialis* Cham., Linnaea 7: 699. 1832 [1833]. *Pithecoctenium vitalba* (Cham.) DC. in A. DC., Prodr. 9: 196. 1845 [as *vitalbae*]. TYPE: Brazil. Equatorial, s. loc., s.d., *F. Sellow* 3271 (lectotype, designated by Bureau & Schumann, 1896: 168, LE not seen; duplicate, B not seen, photo F neg. 18492!).

Bignonia vitalba var. *extratropica* Cham., Linnaea 7: 699. 1832 [1833]. Syn. nov. *Pithecoctenium vitalba* var. *extratropicum* (Cham.) DC. in A. DC., Prodr. 9: 196. 1845. TYPE: Brazil. Rio Grande do Sul: “prope fluvium Jacuhy et Rio Pardo,” *F. Sellow* 1515 (lectotype, designated by Bureau & Schumann, 1896: 168, LE not seen).

Bignonia botryoides Cham., Linnaea 7: 700. 1832 [1833]. Syn. nov. *Pithecoctenium botryoides* (Cham.) DC. in A. DC., Prodr. 9: 195. 1845. TYPE: Brazil. s. loc., s.d., *F. Sellow* (probably 1618(736) from Minas Gerais, Sumidoro, Rio das Velhas) (holotype, LE not seen; isotype, B† not seen, photo F neg. 8478!).

Bignonia phaseoloides Cham., Linnaea 7: 698. 1832 [1833]. *Petastoma phaseoloides* (Cham.) Miers, Proc. Roy. Hort. Soc. London 3: 195. 1863. *Pithecoctenium phaseoloides* (Cham.) Schenck, Bot. Mitt. Tropen 4: 193. 1892. TYPE: Brazil. Santa Catarina: *A. Chamisso* s.n. (lectotype, designated by Sandwith & Hunt, 1974: 156, LE not seen).

Pithecoctenium aubletii Splitg., Tijdschr. Natuurl. Gesch. Physiol. 9: 12. 1842. TYPE: Surinam. s. loc., 26 Jan. 1838, *F. Splitgerber* 544 (lectotype, designated by Sandwith, 1938: 46, L!).

Pithecoctenium catharinae DC. in A. DC., Prodr. 9: 196. 1845. Syn. nov. TYPE: Brazil. Santa Catarina: 1838, *C. Gaudichaud* 179 (lectotype, designated by Sandwith & Hunt, 1974: 156, G-DC not seen, microfiche G-DC 9.196.12!).

Pithecoctenium hexagonum DC. in A. DC., Prodr. 9: 195. 1845. TYPE: Mexico. Chalco, s.d., *G. Andrieux* 222 (holotype, G-DC not seen, photo F neg. 7654!; isotypes, K not seen, M!, W!).

Pithecoctenium hexagonum var. *brasilianum* DC. in A. DC., Prodr. 9: 195. 1845 [as var. *brasiliانا*]. Syn. nov. TYPE: Brazil. Rio S. Francisco, 1838, *J. S. Blanchet* 2905 (holotype, G-DC not seen, microfiche G-DC 9.195.8β!; duplicate, G!).

Pithecoctenium lundii DC. in A. DC., Prodr. 9: 196. 1845. TYPE: Brazil. São Paulo: Nov. 1835, *P. W. Lund* 786 (lectotype, designated by Gentry, 1973b: 910 [as 876], G-DC not seen, photo F neg. 7652!).

Pithecoctenium muricatum Moç. ex DC. in A. DC., Prodr. 9: 194. 1845. *Bignonia muricata* Sessé & Moç., Pl. Nov. Hisp. 99. 1889, nom. illeg. TYPE: Mexico. “agro Guatimalensi ubi vulgo Petachillos” [Morelos, Cuernavaca], tab. 820 in A. DC., Calques Fl. Mexique. 1874 (lectotype, designated by de Candolle, 1874: intro. [1], 4: tab. 820, tab. 820 in A. DC., 1874!).

Pithecoctenium echinatum var. *tomentosum* Hassl., Bull. Herb. Boissier 6(4, App. 1): 27. 1898. Syn. nov. TYPE: Paraguay. “Ad margines silvarum Cordillera de Altos,”

Jan., *E. Hassler* 1766 (lectotype, designated here, G!; duplicate, NY!).

Pithecoctenium echinatum var. *intermedium* Hassl., Bull. Herb. Boissier 6(4, App. 1): 27. 1898. Syn. nov. *Pithecoctenium vitalba* var. *rostratum* Hassl., Repert. Spec. Nov. Regni Veg. 9: 56. 1910, nom. illeg. TYPE: Paraguay. "Central Paraguay," 1888–1890, *T. Morong* 749 (holotype, G not seen; isotypes, F!, MICH!, MO!, NY!, US!).

Pithecoctenium echinatum var. *tomentosum* f. *grandiflorum* Hassl., Repert. Spec. Nov. Regni Veg. 9: 56. 1910 [as f. *grandiflora*]. Syn. nov. TYPE: Paraguay. "In campis rupestribus Cordillera de Altos," Dec., *E. Hassler* 2127 (holotype, G not seen; isotypes, BM!, G!, GH!, NY!, W!).

Pithecoctenium vitalba f. *glabratum* Hassl., Repert. Spec. Nov. Regni Veg. 9: 56. 1910. Syn. nov. TYPE: Paraguay. "In dumetis ad ripas rivulorum pr. Esperanza," Nov., *T. Rojas* [*Hassler number series*] 10708 (lectotype, designated here, G!; duplicates, A!, BM!, NY!, P not seen, S!, W!).

Pithecoctenium vitalba f. *intermedium* Hassl., Repert. Spec. Nov. Regni Veg. 9: 56. 1910. Syn. nov. TYPE: Paraguay. "In valle fl. Y-aca, in dumeto prope Chololo," Dec., *E. Hassler* 6889 (lectotype, designated here, G!; duplicate, NY!).

Pithecoctenium glaucum Rusby, Mem. New York Bot. Gard. 7: 354. 1927. TYPE: Bolivia. Rurrenabaque, 1000 ft., 5 Jan. 1922, *M. Cárdenas* 2063 (holotype, NY!; isotypes, K not seen, US!).

Young branchlets densely to sparsely tomentose or puberulent with ascending trichomes, or sparsely pilose, with trichomes less than 1 mm long, to glabrous or trichomes only at nodes, scattered to dense lepidote, without noticeable lenticels, interpetiolar ridges weak or absent; pseudostipules lanceolate, oblong or linear (rarely falcate or oblanceolate), $3\text{--}15 \times 1\text{--}6$ mm. Leaves with tendrils trifid, or more frequently additionally branched, tips usually filamentous, infrequently disk-like; petiole 2–11 cm long, tomentose or adaxially tomentose, dense to scattered short-pilose, puberulent, or glabrous; petiolule 0.5–7.5 cm long, tomentose or adaxially tomentose, dense to scattered short-pilose, puberulent, or glabrous; leaflets ovate to suborbicular, (rarely 3–) $4.5\text{--}17 \times 2.2\text{--}12$ cm, membranous, veins palmate at base, with 3 to 5 (rarely 6) pairs of secondary lateral veins, tomentose or short-pilose to glabrous or with trichomes restricted to base or veins, pellucid-lepidote, generally with large glands near axils of basal veins, base truncate to cordate or obtuse, apex acute, or obtuse or acute and then abruptly short-acuminate. Raceme, or rarely racemose panicle, 3–27 cm long with 3 to 30 flowers, peduncle, rachis, and pedicel tomentose (rarely puberulent) or peduncle and rachis pilose to glabrous and pedicel tomentose, lepidote; bracteoles lanceolate, narrow-elliptic, or linear, 2–4 (rarely 8) mm long, caducous. Flower with calyx $7\text{--}17 \times 8\text{--}15$ mm, densely to sparsely tomen-

tose, lepidote, often with large glands, especially near apex; corolla densely tomentose above base, white or often yellow in throat and adaxial surface of lobes, (rarely 3) $3.5\text{--}6.8$ cm long, tube (rarely 2) $2.7\text{--}5.6$ cm long, length of thickened glabrous section 5–16 mm, width of tube at mouth 12–25 mm, glabrous internally except with a villous ring of trichomes at stamen insertion, the trichomes turgid and moniliform, lobes $7\text{--}15 \times 7\text{--}16$ (rarely 22) mm; stamens and staminode inserted 5–16 mm from base of tube, longer filaments (rarely 15–) $17\text{--}25$ (rarely 28) mm long, shorter filaments 12–19 (rarely 20) mm long, anthers 3–6 mm long, staminode 2–11 mm long; disc $1\text{--}3 \times 3\text{--}7$ mm; pistil $2.7\text{--}5.4$ cm long, ovary broadly elliptic, $3\text{--}7 \times 2\text{--}5$ mm, densely sericeous, stigma broadly ovate or rhombate. Capsule $8\text{--}31.5 \times 3.5\text{--}8$ cm, $1.5\text{--}4.5$ cm in diam., wall 1.5–4.5 mm thick, base acute to acuminate (rarely obtuse), apex rounded to acute, with echinate appendage remaining attached to replum and septum when valves fall away, valve surface echinate, the spines $1\text{--}7 \times 1\text{--}3$ mm, conical at base, the slender tips eventually breaking off with age, septum margin (rarely 0.4) $0.6\text{--}1.5$ cm thick at thickest point, funicular scars broadly oblong (rarely linear); seeds $2\text{--}4 \times 3.5\text{--}9$ cm, basal 3–8 mm free of wing.

Figures: Bureau and Schumann (1897: t. 86, as *Pithecoctenium echinatum*); Fabris (1965: fig. 19, i–k, as *Pithecoctenium echinatum*); Gentry (1973b: fig. 27, as *Pithecoctenium echinatum*).

Distribution. Mexico from the Tropic of Cancer throughout Central America and into western South America through Peru and Bolivia to northern Argentina, and into eastern South America through both Amazonian and Atlantic Brazil to Paraguay, northern Argentina, and Uruguay, also in Cuba, Jamaica, and Trinidad, at 0–1900 m elevation, in any disturbed habitat (Fig. 1A). Reportedly naturalizing in southern Florida (*Fisher s.n.*, FTG). Gentry (1973b) regarded this as both geographically and ecologically one of the most wide-ranging species of Bignoniaceae, although never extremely abundant. He suggested that its vast distribution is in large part due to the dispersability of the seeds, and poetically expressed "The lightness and aerodynamic stability of a floating seed of this species makes its path of descent a thing of beauty even in perfectly still air; with a breeze a seed remains airborne indefinitely" (Gentry, 1973b: 912–913).

Phenology. For the whole geographic range, flowering and fruiting throughout year. In Mexico, Central America, Colombia, and Venezuela, flowering primarily from April through August; in Peru and Amazonian and northern Atlantic Brazil, flowering

primarily from December to March; and in southern Atlantic Brazil, Bolivia, Paraguay, Argentina, and Uruguay, flowering primarily October to February. Gentry (1973b) reported that most flowering occurs (in Panama) during the wet season, but that individual plants may be found in flower at other times, and that the fruit takes almost a year to mature with the seeds released in the middle of the dry season.

Common names. Peine de mico (Mexico, Gentry, 1982b; Nicaragua, Gentry, 2001; El Salvador and a generalized Central America, Standley & Williams, 1974); Peine de mono (Panama, Gentry, 1973b; Venezuela, Gentry, 1982a; Mexico, Gentry, 1982b); Pente de macaco (Brazil, Sandwith & Hunt, 1974); Cucharilla (Ecuador, Dodson & Gentry, 1978); Rasqueta (Venezuela, Gentry, 1982a); Xache'ma'ax (Maya, Gentry, 1982b); Kees-keesie-kam-kam, Kappellendoos (Suriname, Sandwith, 1938); Espiguilla (Peru, Macbride, 1961); Barbasco (Bolivia, *Nee* 35127); Kaí Kiguá (Paraguay, *Schinini* 5024), Ka'i platillo (Paraguay, *Binacional* 1119); Cucharillo, Lengua de vaca, Petaquillas (seeds), Shape (Guatemala, Standley & Williams, 1974); Pico de pato, Bateíta (Central America, Standley & Williams, 1974); Xachextabay, Netoloc, Xtabay (Yucatan-Maya, Standley & Williams, 1974); Mariposas (Central America, seeds), Palomitas (Central America seeds) (Burger & Gentry, 2000).

Uses. Cultivated as an ornamental (Sandwith & Hunt, 1974); valves reported to be used for scouring and cleaning, or as a grater, leaves used in making lotion for skin problems (Standley & Williams, 1974). One report from Bolivia of whole vine being used to kill fish (*Nee* 35127).

Prior to 1975, most 20th-century botanists (Sandwith, 1938, 1945b; Macbride, 1961; Fabris, 1965; Adams, 1972; Gentry, 1973b; Sandwith & Hunt, 1974; Standley & Williams, 1974) treated this species as *Pithecoctenium echinatum* (Jacq.) K. Schum., based on *Bignonia echinata* Jacq. *Bignonia echinata* was published by Jacquin (1760) with a brief diagnosis and no indication of type. In 1763, Jacquin published a much more complete description of *B. echinata*, indicated the habitat as Carthagenia (Colombia), and presented an excellent illustration of the capsule and seed. In 1974, Sandwith and Hunt proposed this illustration (Jacquin, 1763, tab. 76, f. 52) as the neotype of *B. echinata*. K. Schumann (1894) is generally credited with the transfer of *B. echinata* to *Pithecoctenium*, but the transfer had been previously made in 1888 by Baillon (1891).

In 1975, Gentry (1975a) selected *Miller s.n.* (BM) [= *Pithecoctenium echinatum*] as the lectotype of *Bignonia crucigera* L. and published the new combination *P. crucigerum* (L.) A.H. Gentry, a name

with higher priority than *P. echinatum*. Barrie (1991) argued that the *Miller* specimen could not be selected as the lectotype as it is not clear that it was ever seen by Linnaeus. Barrie (1991) noted that, while there are no specimens in any of the Linnaean herbaria or in the Clifford herbarium (BM) with this name, there are three elements associated with it. Linnaeus (1753) included in his original publication the citations *Gron. virg.* 73 [Gronovius's *Flora Virginia* (1739, 1: 73)] and *Moris. hist.* 3. p. 672 s. 15. t. 3. f. 16 [Morison's *Plantae Historiae* (1699, 3: 672 [612])], and there is a specimen cited by Gronovius (*Clayton* 100, BM), and a plate in Morison (s. 15. t. 3. f. 16) (Barrie, 1991). In addition, Barrie (1991) presented evidence that Linnaeus had seen, prior to 1753, unpublished plates of Plumier, one of which Linnaeus annotated, with minor rephrasing, with his original 1753 description (Barrie, 1991). Gentry (1975a) rejected *Clayton* 100 as the lectotype of *B. crucigera* as he found it to be a sample of *B. capreolata* L., a species that differs from the original description of Linnaeus for *B. crucigera*. He rejected the Plumier plate (which represents *Tanaecium crucigerum* Seem.), believing that it was not original material (Gentry, 1975a). The Morison plate and the *Miller* specimen both are of the same species, formerly referred to as *P. echinatum*, and Gentry (1975a) chose the specimen over the plate as the lectotype of *B. crucigerum*. Barrie (1991), finding the *Miller* specimen could not be used, selected the Morison plate, thereby preserving the current use of the name, *P. crucigerum*, in the sense of Gentry. While the Plumier plate could have been chosen as the lectotype, there is no reason to reject Barrie's (1991) selection.

Type materials of *Bignonia tiliifolia* Kunth, *Pithecoctenium aubletii* Splitg., *P. glaucum* Rusby, *P. hexagonum* DC., *P. lundii* DC., *P. muricatum* Moç. ex DC., and *B. squalus* Vell. were examined in this study, and, based upon these observations, the species were placed in synonymy of *P. crucigerum*, thereby following Gentry (1982a). The Vellozo plate 13 (1827) was chosen as the lectotype of *B. squalus* Vell., as no Vellozo *Bignonia* specimens have been found (Gentry, 1975b). Martius (1841) published *P. cordifolium* Mart. as a superfluous name for *B. squalus*, citing, in addition to the Vellozo plate of *B. squalus*, the specimen *Martius Herbarium Florae Brasiliensis* 516 [A. L. P. da Silva Manso s.n.]. This specimen has been treated in the literature (Gentry, 1982a) as the type of *P. cordifolium*. However, as Martius (1841) did not specify the type of *P. cordifolium*, the type is automatically the type of *B. squalus* (International Code of Botanical Nomenclature 7.5 in McNeill et al., 2006). The lectotype of *P. muricatum* (de Candolle, 1874: t.

820) is a tracing of t. 217 in Sessé & Moç., Fl. Mex. Icones (McVaugh, 2000). *Bignonia muricata* Sessé & Moç. (Pl. Nov. Hisp. 99. 1889) cited this same plate and is, therefore, a superfluous name for *P. muricatum*.

The only material that de Candolle (1845) cited for *Pithecoctenium hexagonum* var. *brasilianum* DC. was a collection made by Blanchet in Brazil along the Rio São Francisco. The collection number, 2905, is added here to the type citation and the name placed in synonymy of *P. crucigerum* based on observation of the G-DC microfiche of *Blanchet 2905* and the duplicate of *Blanchet 2905* at G.

Sandwith and Hunt (1974: 156) lectotypified *Bignonia phaseoloides* Cham. and treated this name as a synonym of *Pithecoctenium echinatum*, as did Bureau and Schumann (1896), who cited *F. Sellow 666*, a probable syntype or isosyntype. Gentry (1982b) treated *B. phaseoloides* as a synonym of *P. crucigerum*, based on Bureau and Schumann (1896), without seeing type material. Type material was not seen in this study, and *B. phaseoloides* is placed in synonymy strictly based on these earlier works.

Loesener (1919) published *Pithecoctenium tribrachiatum* Loes. with two syntypes, *J. H. Schenck 860* and *861*, both presumed at B and destroyed. The absence or existence of duplicates of the syntypes has not been confirmed in this study. Based on Loesener's (1919) description, in particular the shape of the branchlets and nature of the multi-trifurcate tendrils, Gentry's (1982a) treatment of this entity from Veracruz, Mexico, as a synonym of *P. crucigerum* is supported by this study.

Pithecoctenium botryoides (Cham.) DC. is placed in synonymy of *P. crucigerum* with some uncertainty. Chamisso (1832: 700) cited the type as "Brasilia. Sellow," a poor specimen with fallen flowers. Bureau and Schumann (1896: 170) cited two specimens: *Sellow 1618(736)* from Minas Gerais, Sumidoro, Rio das Velhas, and *Glaziou 14113* without locality. A photo (F neg. 8478) of *Sellow 1618(736)* (B) was seen in this study. Bureau and Schumann (1896) distinguished *P. botryoides* from *P. vitalba* and *P. echinatum* [= *P. crucigerum*] by its abbreviated inflorescence. It seems no different from other specimens of *P. crucigerum* with similar few-flowered racemes (such as *Irwin et al. 10343*, MO).

Examination of type materials of *Pithecoctenium catharinae* DC. and *Bignonia vitalba* Cham. leads to the names being placed in synonymy of *P. crucigerum*, following Sandwith and Hunt (1974), who treated these as synonyms of *P. echinatum* [= *P. crucigerum*].

Inflorescence types and a pubescent versus glabrous style base have been used to distinguish *Pithecoctenium vitalba* from *P. echinatum*. Hassler

(1910) associated a racemose panicle and a pilose style base with *P. vitalba* and a raceme and glabrous style base with *P. echinatum*, while Bureau and Schumann (1896) associated a racemose inflorescence (in the key) and pilose style base with *P. vitalba* and a paniculate inflorescence (in the key) and glabrous style base with *P. echinatum*. While placing *P. vitalba* in synonymy with *P. echinatum*, Sandwith and Hunt (1974) found that specimens from southern Brazil and Paraguay had branched inflorescences and tended to have pubescent style bases, and suggested that these characters be carefully examined in studying *P. echinatum* and related entities. Interesting variation in these characters was noted in the course of this study. Branched inflorescences were only found in material collected in southern Brazil (Minas Gerais, Paraná, Santa Catarina, and Rio Grande do Sul), southeastern Paraguay (Caaguazú and Alto Paraná), and northern Argentina (Misiones); all of these (with flowers dissected) were found to have pilose style bases. However, pilose style bases were also found in material with unbranched inflorescences. One collection from Ceará (northeastern Brazil, *Gentry et al. 50193*, MO) had a pilose style base. All specimens (with flowers dissected) from Argentina with unbranched inflorescences had pilose style bases, while one collection from Rio Grande do Sul (southern Brazil), with an unbranched inflorescence, had a glabrous style base (*Pedersen 12620*, MO), and one had a pubescent style base (*Richter s.n.*, *HB-29882*, MO). All collections (with flowers dissected) from Central America, Cuba, Venezuela, Bolivia, and Amazonian Brazil had glabrous styles, while one collection from Colombia (*Smith 350*, MO) and one from Peru (*Núñez 9952*, MO) had pilose style bases. Flowers of the other three species in the genus were also examined: *P. dolichoides* was found to always have a pilose style base while that of *P. falcatum* was always glabrous (with a few lepidote scales), but the styles in *P. carolinae* varied from totally glabrous, to pilose at base only, to pilose nearly to the apex. While the variation in these characters is interesting, it does not seem worthy of taxonomic recognition.

Chamisso (1832) published *Bignonia vitalba* with two varieties, *B. vitalba* var. α , *aequinoctialis* and var. β , *extratropica*. Chamisso (1832) described *B. vitalba* var. α , *aequinoctialis* as villous-pubescent, with broadly ovate, cordate leaflets and inflorescences sometimes branching, while var. β , *extratropica* was described as glabrous, except for the petiolules, with narrow ovate leaflets with rounded to truncate bases and inflorescences simple racemes. De Candolle (1845) transferred *B. vitalba* to *Pithecoctenium*, treating var. *aequinoctialis* as the typical variety and

recognizing the second variety as *P. vitalba* var. *extratropicum*, based on its lack of pubescence and narrow ovate leaflets with truncate to rounded bases. Bureau and Schumann (1896) designated lectotypes for *P. vitalba* and *P. vitalba* var. *extratropicum* and recognized the latter on the same characteristics as de Candolle (1845), but suggested the recognition was uncertain in such a variable and widespread species. The type of *P. vitalba* var. *extratropicum* was not seen in this study, but the descriptions of Chamisso (1832), de Candolle (1845), and Bureau and Schumann (1896) suggest that it fits well within *P. crucigerum*, which varies throughout its geographic range in pubescence and leaf base. For example, in south Atlantic Brazil, specimens with simple racemes had leaf bases obtuse, truncate, subcordate, and cordate and abaxial leaf surfaces glabrous to pubescent only on veins to short-pilose or tomentose overall. Therefore, *P. vitalba* var. *extratropicum* is treated in this study as a synonym of *P. crucigerum* without varietal recognition.

Hassler (1898) published *Pithecoctenium echinatum* var. *tomentosum* Hassl. and *P. echinatum* var. *intermedium* Hassl., distinguishing them from the typical variety based on pubescence and leaf base characters. Three syntypes of *P. echinatum* var. *tomentosum* were seen in this study, the most complete chosen as the lectotype, and the name placed in synonymy with *P. crucigerum*. Five isotypes of *P. echinatum* var. *intermedium* were seen in this study, and, based on their examination, *P. echinatum* var. *intermedium* was also placed in synonymy of *P. crucigerum*.

Hassler (1910) published *P. echinatum* var. *tomentosum* f. *grandiflorum* based on its larger flowers, with calyx 12 mm long and corolla 6 cm long. Corolla size in *P. crucigerum* varies gradually from 3 to 6.8 cm long, with most of the flowers measured falling between 4.2 and 6.2 cm. Calyces vary gradually from 7 to 17 mm long, with most of the flowers measuring between 8 and 14 mm. The type of *P. echinatum* var. *tomentosum* f. *grandiflorum* was examined, and in all aspects fits well within the variation of *P. crucigerum*, and the name is placed in synonymy.

Hassler (1910) recognized *Pithecoctenium echinatum* var. *intermedium* Hassl. as a variety of *P. vitalba*, publishing the superfluous name *P. vitalba* var. *rostratum* Hassl. with two forms, *P. vitalba* var. *rostratum* f. *glabratum* Hassl. and *P. vitalba* var. *rostratum* f. *intermedium* Hassl. The forms were distinguished on pubescence characters. Three syntypes of *P. vitalba* var. *rostratum* f. *glabratum* and two of *P. vitalba* var. *rostratum* f. *intermedium* were seen; those with the most isosyntypes were chosen as the

lectotypes, and the names were placed in synonymy of *P. crucigerum*.

Selected specimens examined. BELIZE. **Cayo:** S of Millionario, A. H. Gentry 7666 (MO); 1 mi. E of Georgeville on Western Hwy., Gentry 7855 (MO). COSTA RICA. **Guanacaste:** Cantón de Liberia, P.N. Santa Rosa, Península de Santa Elena, J. F. Morales 2928 (MO). EL SALVADOR. **Sonsonate:** s. loc., E. A. Montalvo 3446 (MO). GUATEMALA. **Petén:** Tikal National Park, Tikal, E. Contreras 170 (MO). HONDURAS. **Francisco Morazán:** Inmediaciones de la U.N.A.H., J. Bourdeth 44 (MO). MEXICO. **Chiapas:** 18.5 mi. N of Arriaga on rd. 200, R. H. Maxwell 266 (MO). **Jalisco:** Mpio. de Autlán, 3 km al S de Ahuacapán, E. J. Lott et al. 445 (MO). **Oaxaca:** Mun. Santiago Iachiguiri, Distr. de Tehuantepec, 17.8 km al NO de Lachiviza, camino a Santiago Iachiguiri, C. Torres R. & A. Campos V. 13915 (MO). **Querétaro:** La Cuesta, 3 km al S de Escanelilla, Mpio. Pinal de Amoles, N. Fernández R. 1582 (MO). **Tamaulipas:** Vic. of Victoria, E. Palmer 403 (MO). NICARAGUA. **Estelí:** Rd. from Estelí N to Regado, then W to San Juan de Limay, then N to Pueblo Nuevo, D. Neill 1200 (MO). PANAMA. **Canal Zone:** Barro Colorado Island, R. Foster 840 (MO).

CUBA. **Granma:** Rd. to Pico Turquino Trail, Sierra Maestra, Río Yara Valley, A. H. Gentry 50935 (MO). JAMAICA. **St. Catherine:** 1.5 mi. SE of Sligoville, G. R. Proctor 31733 (F). TRINIDAD. Penal Rock Rd., N. L. Britton et al. 1985 (NY).

ARGENTINA. **Corrientes:** Dep. General Paz, Tacuaracuarendú, T. M. Pedersen 11527 (MO). **Misiones:** Montecarlo, 26 km S of Eldorado, S. A. Renvoize et al. 3262 (MO); Dep. Guaraní, 7 km al W del Ayo. Soberbio, J. H. Hunziker et al. 10835 (MO); Dep. San Pedro, entre San Pedro y Puerto Piray, km 76, F. O. Zuloaga et al. 2061 (MO). BOLIVIA. **Beni:** Prov. Ballivan, Espiritu en la zona de influencia del Río Yacuma, S. G. Beck 2573 (MO). **La Paz:** Prov. Nor Yungas, 2 km S of San Pedro on rd. to Yolosa, J. C. Solomon & M. Nee 12607 (MO). **Santa Cruz:** Prov. Andres Bañez, 1 km N of center of Cotoca, M. Nee 33550 (MO); Prov. Cordillera, Alto Parapetí, R. de Michel 226 (MO). BRAZIL. **Acre:** Rio Branco, Km 1 ao Km 23 da Rod. Rio Branco-Porto Velho, J. U. Santos et al. 84 (MO). **Ceará:** 2 km S of Farias Brito, CE-021, A. H. Gentry et al. 50193 (MO). **Goiás:** Serra do Rio Preto, ca. 14 km E of Cabeceiras, H. S. Irwin et al. 10343 (MO). **Mato Grosso do Sul:** Antonio João, descida p/Campeste, G. Hatschbach & J. M. Silva 49108 (MO); Cuiabá, Martius Herbarium Florae Brasiliensis 516 [A. L. P. da Silva Manso s.n.] (BM, G, L, MO, NY, W). **Minas Gerais:** Ituiutaba, Fuindas, A. Macedo 2037 (MO). **Paraná:** Mun. Campo Largo, Retire Grande, G. Hatschbach 41085 (MO); Mun. Curitiba, Uberaba de Baixo, G. Hatschbach 40277 (MO). **Rio de Janeiro:** Mun. de Petrópolis, Araras, Vale das Videiras, D. Sucre et al. 10598 (MO). **Rio Grande do Sul:** Caracol, E. Richter s.n.(HB-29882) (MO); Mun. Gravataí, Fonte das Ninfas on rd. to S. Francisco de Paula, T. M. Pedersen 12620 (MO). **Santa Catarina:** Mun. Chapecó, Moinho São Domingo, N of Chapecó, L. B. Smith & R. M. Klein 13258 (MO); Mun. Lajes, Índios, A. Lourteig 2263 (MO). COLOMBIA. **Bolívar:** Mpio. de Achi, entre San Agustín y Villa Uribe, Serranía de San Lucas, V. Cuadros H. 1617 (MO). **Chocó:** carretera Panamericana, entre el Río San Pablo y el Río Pató, E. Forero et al. 5537 (MO). **Guajira:** Mun. Minguao, pic de la Sierra Nevada de Santa Marta, V. Cuadros H. 2008 (MO). **Magdalena:** Santa Marta, H. H. Smith 350 (MO). ECUADOR. **Guayas:** Cerro Azul, Cordillera Chongon-Colonche, behind Cemento Nacional, 12 km

W of Guayaquil, Quebrada Canoa, A. H. Gentry & C. Josse 72352 (MO). FRENCH GUIANA. Route montant au Rorota, H. Jacquemin 1931 (MO). **Cayenne:** Au pied de la colline du Montabo, G. Cremers 5837 (MO). PARAGUAY. "In dametis ad ripam rivuli Salado," E. Hassler 1475 (syntype for *P. echinatum* var. *tomentosum*, G; isosyntype, NY); "L'Assomption," B. Balansa 485 (syntype of *P. echinatum* var. *tomentosum*, G); "in dumetis ad ripas rivulorum pr. Esperanza," T. Rojas [Hassler number series] 10708-a (syntype of *P. vitalba* f. *glabratum*, G; isosyntypes, A, BM); "in valle fl. Y-aca in dumeto prope Chololo," E. Hassler 6673 (syntype of *P. vitalba* f. *glabratum*, G); "in dumetis pr. Villa Rica," E. Hassler 8636 (syntype of *P. vitalba* f. *intermedium*, G). **Cordillera:** W side of Río Piribebuy basin, 27 km W of Arroyos y Esteros, E. Zardini & C. Velázquez 20297 (MO). **Itapúa:** Reserva Salto Tembey, D. R. Brunner 1310 (MO). PERU. **Cusco:** La Convención, Maranura, Chaullay, P. Núñez 8123 (MO). **Junín:** Chanchamayo Province, Hacienda La Genoa, San Ramón, valley of Río Tulumayo, A. H. Gentry et al. 73258 (MO). **Madre de Dios:** Tambopata Province, alrededores del Alberque turístico Cusco Amazónico, P. Núñez et al. 9952 (MO); Tambopata Province, Las Piedra, Cusco Amazónico, M. Timina & N. Jaramillo 2694 (MO). **San Martín:** N of Uchiza, J. Schunke V. 5744 (MO). SURINAME. **Coronie:** Coronie, along rd. to Coppename Point, A. M. E. Jonker-Verhoef & F. P. Jonker 569 (U). URUGUAY. **Cerro Largo:** Sierra de Ríos, W. G. Herter 1893 (MO). VENEZUELA. **Barinas:** ca. 75 km SW of Barinas on hwy. to San Cristóbal, A. H. Gentry & L. Puig-Ross 14354 (MO). **Guárico:** Ca. del Hato Becerra, sur del Río Orituco, carretera Calabozo–Cazorla, G. Morillo et al. 4243 (MO). **Portuguesa:** 7 km S of Biscucuy, A. H. Gentry & L. Puig-Ross 14369 (MO). **Zulia:** Dito. Miranda, vía El Consejo–Quirós–El Pensado, ca. 5 km O de El Pensado, G. S. Bunting 8668 (MO); Distrito Mara, vic. of Río Guasare, betw. Rancho 505 and Cerro Yolanda, J. A. Steyermark et al. 122887 (MO).

2. *Pithecoctenium carolinae* (Lindl.) G. Nicholson. Ill. Dict. Gard. 3: 152. 1886. *Bignonia carolinae* Lindl., Edwards's Bot. Reg. 28: sub t. 45. 1842. TYPE: from cultivated material at Melbury, Lord Ilchester's seat in Dorsetshire, 1842, s. coll., s.n. (holotype, CGE!).

Pithecoctenium cynanchoides DC. in A. DC., Prodr. 9: 195. 1845. Syn. nov. TYPE: Argentina. Circa Buenos Aires, 1831, C. H. Bacle 52 (holotype, G-DC not seen, microfiche G-DC 9:195.9!, photo F neg. 7657!; duplicate, G!).

Anemopaegma clematideum Griseb., Abh. Königl. Ges. Wiss. Göttingen 19: 222. 1874. Syn. nov. *Pithecoctenium clematideum* (Griseb.) Griseb., Symb. Fl. Argent. 257. 1879. TYPE: Argentina. Córdoba: s. loc., 1870, P. G. Lorentz 120 (lectotype, designated by Fabris, 1965: 353, GOET!; duplicates, CORD not seen, GOET!).

Pithecoctenium cynanchoides var. *pellucidum* Hassl., Repert. Spec. Nov. Regni Veg. 9: 55. 1910. Syn. nov. TYPE: Paraguay. Gran Chaco, ad margines silvarum Loma Clavel, Nov., E. Hassler 2630 (holotype, G not seen; isotype, BM!).

Young branchlets densely short-pilose, with trichomes ca. 0.2 mm long, to glabrous or with trichomes only at nodes, scattered-lepidote, without noticeable

lenticels, interpetiolar ridges weak or absent; pseudostipules oblong (rarely spatulate), 2–9 × 0.5–2.2 mm. Leaves with tendrils trifid, or infrequently additionally branched, tips usually filamentous, infrequently disk-like; petiole 1.2–5 cm long, dense to scattered short-pilose, especially on the adaxial surface; petiolule 0.5–2.5 cm long, dense to scattered short-pilose, especially on the adaxial surface; leaflets deltate, 1.7–6.8 × 0.9–5 cm, membranous, veins palmate at base, with 3 to 5 pairs of secondary lateral veins, scattered pilose to glabrous or with trichomes restricted to base or veins, pellucid-lepidote, sometimes with large glands near axils of basal veins, base truncate to cordate, apex long-caudate or acute and then abruptly long-acuminate. Raceme 1.5–10 cm long with 2 to 14 flowers, peduncle, rachis, and pedicel densely short-pilose to glabrous or with trichomes restricted to nodes, lepidote; bracteoles narrow-elliptic, 2–10 mm long, caducous. Flowers with calyx 5–8 (rarely 10) × 6–8 mm, densely to sparsely tomentose, lepidote, usually with large glands, especially near apex; corolla densely tomentose above base, white or often yellow in throat, 2.5–4.5 (rarely 5.2) cm long, tube 1.8–3.7 cm long, length of thickened glabrous section 3–7 (rarely 9) mm, width of tube at mouth 9–20 mm, glabrous internally except with a villous ring of trichomes at stamen insertion, the trichomes turgid and moniliform, lobes 6–15 × 5–18 mm; stamens and staminode inserted 4–8 mm from base of tube, longer filaments 12–16 mm long, shorter filaments 8–12 mm long, anthers 2.5–3 mm long, staminode 1.5–7 mm long; disc 1–1.5 × 2.2–3.3 mm; pistil 1.7–3.1 cm long, ovary broadly elliptic, 2–4 × 1.5–2.5 mm, densely sericeous, stigma broadly ovate or rhombate. Capsule 4–13.5 × 2–5 cm, 0.2–0.8 cm in diam., wall up to 1.5 mm thick, base obtuse to acute, apex obtuse to acute, with muricate appendage remaining attached to replum and septum when valves fall away, valve surface muricate, the tubercles 0.5–1 × 0.1–0.5 mm, conical at base, the slender tips generally breaking off with age, septum margin 0.1–0.3 cm thick at thickest point, funicular scars short and broad; seeds 1.5–3 × 2–4.2 cm, basal 0.5–1.5 mm free of wing, or thin marginal wing completely surrounding base.

Figures: Fabris (1965: fig. 19a–h, as *Pithecoctenium cynanchoides*); Fabris (1979: fig. 259, as *P. cynanchoides*); Lindley (1844: tab. 54, as *Bignonia carolinae*).

Distribution. Southeastern Bolivia, western Uruguay, northwestern to central Paraguay, and northern Argentina at 50–1500 m elevation. It is generally reported to be found in dry forests, thorn scrub, or pasture (Fig. 1B).

Phenology. Flowering September through March, primarily collected in flower in October through December; fruiting November through July.

Common names. Kalakalá (Paraguay, *Gragson* 287), Waka te le pep (Paraguay, *Arenas* 2397), Galleta de loco (Argentina, *Kiesling* 4503), Peine de mono (Argentina, *Novara* 2148; *Fabris*, 1965), Tripa de fraile (Argentina, *Fabris*, 1965), Yawxtii'tax (Argentina, *Arenas* 2164), Guitarrita, Pitito blanco, Loconte, Trompetilla de venus, Tripa de braya (*Fabris*, 1965).

Uses. The fruits are reportedly boiled or roasted over coals and the seeds eaten (Manxuj-Paraguay, *Gragson* 287). Cultivated as an ornamental (*Fabris*, 1965).

De Candolle (1845) based *Pithecoctenium cynanchoides* DC. on material that he had in his herbarium that had been collected by Bacle near Buenos Aires. The collection number 52 is added here to the type citation based on observation of the microfiche and photo of *Bacle* 52 at G-DC. The duplicate of *Bacle* 52 at G was also studied. This entity has been treated by most 19th- and 20th-century authors (*Bureau & Schumann*, 1896; *Fabris*, 1965, 1979) as *P. cynanchoides*. However, the type of *Bignonia carolinae* Lindl. was observed in this study and found to represent the same species as *P. cynanchoides*, a relationship that had been suggested by *Miers* (1863). *Pithecoctenium cynanchoides* is therefore placed in synonymy of *P. carolinae* (Lindl.) G. Nicholson (based on *B. carolinae*), a name with higher priority. The type of *B. carolinae* is a specimen at CGE taken from a plant grown at the estate of the Earl of Ilchester at Melbury in Dorsetshire. It is believed to have been originally collected in Buenos Aires (*Lindley*, 1844). A plate in *Lindley* (1844: t. 54) is reportedly drawn from material from the same plant from which the original specimen was obtained in 1842 (*Lindley*, 1844). The plate is fairly accurate, except for the tendrils, which are depicted as bifurcate. De Candolle apparently did not see the specimen of *B. carolinae* Lindl. and maintained the species in *Bignonia*, and the name was not included in either *Bureau and Schumann* (1896) or *Fabris* (1965, 1979).

Fabris (1965) designated the lectotype of *Anemopaegma clematideum* Griseb. and placed this into synonymy of *Pithecoctenium cynanchoides* [= *P. carolinae*]. The lectotype and one of its duplicates (at GOET) were seen in this study, and, based upon these observations, the species was placed in synonymy of *P. carolinae*.

Type material of *Pithecoctenium cynanchoides* var. *pellucidum* Hassl. was studied, and the variety was placed into synonymy of *P. carolinae*; the characteristics described by *Hassler* (1910), pellucid-lepidote

leaves, long-caudate leaflets, and capsules 8 cm long and 3 cm wide, are consistent with typical *P. carolinae*.

Pithecoctenium carolinae is most easily distinguished from the closely related *P. crucigerum* using fruit characters: the former has a smaller, thinner fruit (4–13.5 × 2–5 cm, 0.2–0.8 cm in diam. vs. 8–31.5 × 3.5–8 cm, 1.5–4.5 cm in diam.), the valves of which have a thinner wall (up to 1.5 mm thick vs. 1.5–4.5 mm thick) and are covered with minute tubercles (0.5–1 × 0.1–0.5 mm) versus the more substantial spines (1–7 × 1–3 mm) found in *P. crucigerum*. Leaflet size has also been used to separate the two (*Fabris*, 1965), but *P. crucigerum* frequently has leaflets as small (4.5–7 × 2.2–6 cm) as *P. carolinae* with medium to large leaflets (4.5–6.8 × 3–5 cm). Leaflet shape is a more dependable character, but difficult to express: the leaflets of *P. carolinae* are deltate with long-acuminate apices, while those of *P. crucigerum* are ovate to suborbicular with briefly acuminate apices. The flowers of *P. carolinae* tend to be smaller than those of *P. crucigerum* in all aspects, but there is a good deal of overlap in size. For example, the calyx of *P. carolinae* is 5–10 mm long while that of *P. crucigerum* is 7–17 mm long, the corolla of *P. carolinae* is 2.5–5.2 cm long while that of *P. crucigerum* is 3–6.8 cm long, and the longer filaments of *P. carolinae* are 12–16 mm long while those of *P. crucigerum* are 15–28 mm long. *Pithecoctenium carolinae* generally has tendrils simply trifid, while in *P. crucigerum* the three branches of the tendril are commonly additionally branched. The geographic ranges of the species seem to overlap only in southern Bolivia and northernmost Argentina.

Selected specimens examined. ARGENTINA. **Chaco:** Dep. 12 de octubre, Gral. Pinedo, A. G. Schulz 8936 (MO). **Corrientes:** 5 km S of Corrientes on Ruta 12, A. H. Gentry et al. 59116 (MO); Dep. Empedrado, Estancia La Yela, T. M. Pedersen 2972 (MO); Dep. Itatí, Ruta 12, desvío, a Itatí 6 km, A. Schinini & L. Mroginski 1736 (MO). **Santiago del Estero:** Dep. Aguirre, Malbrán, A. A. Saenz & G. Ryhr 199 (MO). **Tucumán:** Tañi Viejo, near Las Tipas, S. Renouze et al. 3381 (MO). BOLIVIA. **Chuquisaca:** Prov. Luis Calvo, Boyuibe 104 km hacia el este, via F. Villazón, S. G. Beck & M. Liberman 9422 (MO). **Santa Cruz:** Prov. Corillera, 2–3 km NW of Boyuibe, along abandoned railroad to Cuevo, M. Nee 35304 (MO). PARAGUAY. **Chaco:** Parque Nac. Defensores del Chaco, entre la casa forestal de Aguadulce y Aguaireca, J. Fernandez Casas & J. Molero 1375 (MO). **Nueva Asunción:** Km 695 de Asunción, Chaco, L. Bernardi 20242 (MO). **Presidente Hayes:** Fortín Tinfunqué, R. Spichiger et al. 2070 (MO). URUGUAY. **Paysandú:** Paysandú, W. G. Herter 1032 (MO).

3. *Pithecoctenium dolichoides* (Cham.) Bureau ex K. Schum. in Engl., Nat. Pflanzenfam. 4(3b): 218. 1894. *Bignonia dolichoides* Cham., Linnaea

7: 696. 1832 [1833]. TYPE: Brazil. "Brasilia meridionalis a S. Paulo ad meridiem," s.d., *F. Sellow* s.n. [herbarium no. 332] (holotype, B†, photo F neg. 18484!; isotype, K not seen).

Young branchlets densely golden long-villous with trichomes over 1.5 mm long, scattered lepidote, without noticeable lenticels, interpetiolar ridges weak or absent; pseudostipules spatulate or ovate and basally attenuate, $3\text{--}20 \times 2\text{--}15$ mm. Leaves with tendrils trifid, or more frequently additionally branched, tips frequently disk-like; petiole 1–4.5 cm long, densely golden long-villous; petiolule 1–3 cm long, densely golden long-villous; leaflets ovate (rarely broadly oblong), $6\text{--}16 \times 2.5\text{--}10.5$ cm, membranous, veins palmate at base, with 4 to 7 pairs of secondary lateral veins, dense long-villous, pellucid-lepidote, base subcordate to deeply cordate, apex acute and abruptly short-acuminate or short-caudate. Raceme 13–25 cm long with 10 to 20 flowers, peduncle, rachis, and pedicel densely golden long-villous, lepidote; bracteoles filiform, 3–10 mm long, caducous. Flowers with calyx $7\text{--}13 \times 10\text{--}13$ mm, densely tomentose to sericeous, lepidote; corolla densely sericeous above base, white or cream to yellow, 6.2–7 cm long, tube 4.5–5.8 cm long, length of thickened glabrous section 8–10 mm, width of tube at mouth 15–25 mm, glabrous internally except with a villous ring of trichomes at stamen insertion, the trichomes turgid and moniliform, lobes $10\text{--}16 \times 10\text{--}17$ mm; stamens and staminode inserted 5–10 mm from base of tube, longer filaments 27–35 mm long, shorter filaments 20–21 mm long, anthers ca. 4 mm long, staminode 6–10 mm long; disc $1.5\text{--}3 \times 3.5\text{--}6$ mm; pistil 3.7–4.3 cm long, ovary broadly elliptic, ca. $6 \times 4\text{--}4.2$ mm, densely sericeous, stigma broadly rhombate or obovate. Mature capsule and seed not seen, immature capsule 11.5×3.5 cm, 0.7 cm in diam., base acute, apex acute, valve surface echinate, the spines ca. 2×2 mm, laterally flattened at base, the slender tips generally breaking off with age.

Distribution. Southern Atlantic Brazil, from Minas Gerais to Rio Grande do Sul (Sandwith & Hunt, 1974), Santa Catarina, São Paulo, Rio de Janeiro, and Paraná observed in this study, at 800 m elevation (Fig. 1B).

Phenology. Flowering October through January, immature fruits collected in January.

Common names. Pente de maco (Sandwith & Hunt, 1974; *W. Hoehne* 1532).

Uses. Cultivated as an ornamental (Sandwith & Hunt, 1974).

Chamisso (1832: 698) published *Bignonia dolichoides* Cham., citing the type as "in Brasilia intratropica legit Sellow." Sandwith and Hunt (1974) provided further collection locality details and

a herbarium number, and indicated the deposition of the holotype at B and an isotype at K. An additional collection at US (labeled *Sellow* 38, digitized image at <http://ravenel.si.edu/botany/types/>!) is a possible isotype.

This species is distinguished from the widespread and variable *Pithecoctenium crucigerum* primarily based on the very distinctive long golden trichomes that are found on most of the vegetative parts as well as the inflorescence peduncle, rachis, and pedicels. While vegetative and inflorescence pubescence is a very variable character in *P. crucigerum*, no trichomes have been seen in that species that approach the length of those in *P. dolichoides* (longer than 1.5 mm). The flowers of *P. dolichoides* also tend to be somewhat larger (corolla 6.2–7 cm) than those of *P. crucigerum* (3–6.8 cm); however, there is a wide range in flower size in the latter and flower size ranges do overlap for the two species. It could be argued, as Sandwith and Hunt (1974) suggest, that *P. dolichoides* might be better treated as an infraspecies of *P. crucigerum*. Collection of the mature fruit and seed would help in determining the relationship of these two taxa.

Selected specimens examined. BRAZIL. **Paraná:** Mun. Balsa Nova, campina da Cascavel, *G. Hatschbach* 39175 (MO); Mun. Tijucas do Sul, Pirai, *G. Hatschbach* 40395 (MO); Mun. S. José dos Pinhais, Guaricana, *J. M. Silva & P. Ruas* 80 (MO). **Rio de Janeiro:** Alto Macabé de Nova Friburgo, *A. Glaziov* 18379 (MO). **Santa Catarina:** Rio do Sul, Alto Matador, pinhal, *P. R. Reitz & R. M. Klein* 7286 (NY). **São Paulo:** Apirai, sítio da Pedra, *K. D. Barreto et al.* 3137 (MO).

4. *Pithecoctenium falcatum* (Vell.) A. Pool, comb. nov. *Bignonia falcata* Vell., Fl. Flumin. 245. 1825 [1829]. TYPE: tab. 17 (in part) in Vell., Fl. Flumin. Icones 6. 1827 [1831], including branchlet, leaves, fruit, and seeds and excluding inflorescence and flowers (lectotype, designated here, tab. 17 (in part) in Vell., 1827 [1831]!). EPITYPE: Brazil. Bahia: Coaraci, Almadina, 18 km de Estrada, *T. S. dos Santos* 574 (epitype, designated here, MO!; duplicates, CEPEC not seen, NY!). Figure 2.

Pithecoctenium cordifolium DC. in A. DC., Prodr. 9: 194. 1845, non *Pithecoctenium cordifolium* Mart., 1841. Syn. nov. *Neves-armondia cordifolia* K. Schum., nom. illeg. *Pithecoctenium hatschbachii* A. H. Gentry, Ann. Missouri Bot. Gard. 66: 784. 1979 [1980]. TYPE: Brazil. São Paulo: Prope Jacasava, Dec. 1817, *C. Martius* 408 (lectotype, designated by Gentry, 1979: 784, M!).

Young branchlets glabrous, without noticeable lenticels, interpetiolar ridges present; pseudostipules not seen. Leaves with tendrils trifid, or additionally branched, tips filamentous; petiole 3.5–9 cm long,



Didyn. Angiosp.
BIGNONIA FALCATA
(Tab. 17.)

Figure 2. *Pithecoctenium falcatum* (Vell.) A. Pool, excluding flowers. Reprinted from Vellozo, 1827 [1831], t. 17, as *Bignonia falcata* Vell.

glabrous; petiolule 2.5–6.5 cm long, glabrous; leaflets ovate to lanceolate, 8–15 × 6–12 cm, membranous, veins palmate at base, with 3 to 6 pairs of secondary lateral veins, glabrous or with trichomes restricted to base adaxially, pellucid-lepidote, with large glands near axils of basal veins, base deeply cordate, apex acuminate or acute, and short-caudate. Racemose panicle (or rarely raceme), 20–25 cm long with 25 to 28 flowers, peduncle, rachis, and pedicel puberulent or tomentose or peduncle glabrous, lepidote; bracteoles awl-shaped, ca. 5 mm long, caducous. Flowers with calyx 10–13 × 12–15 mm, tomentose at least at base, lepidote, sometimes with scattered large glands; corolla densely tomentose above base, white to cream or yellow in throat, 4.3–5.6 cm long, tube 3.3–4.5 cm long, length of thickened glabrous section 12–15 mm, width of tube at mouth 15–19 mm, glabrous internally except with a villous ring of trichomes at stamen insertion, the trichomes turgid and moniliform, lobes 10–12 × 10–15 mm; stamens and staminode inserted 10–12 mm from base of tube, longer filaments ca. 25 mm long, shorter filaments ca. 22 mm long, anthers 5–6 mm long, staminode 5–6 mm long; disc 2–3 × 4–7 mm; pistil 4.5–4.8 cm long, ovary oblong, 5–6 × 2–3 mm, lepidote and otherwise glabrous, stigma broadly elliptic or rhombate. Capsule ca. 28 × 5.5 cm, ca. 2 cm in diam., wall ca. 5 mm thick, base attenuate, apex acute without apical appendage, valve surface smooth with very few, small, dull tubercles, septum margin ca. 1.3 cm thick at thickest point, funicular scars long and linear; seeds 2.8–3 × 6–7.5 cm, basal 10–15 mm free of wing.

Figures: Vellozo (1827: t. 17, excluding inflorescence and flowers, as *Bignonia falcata*), reproduced here as Figure 2; Gomes (1952: pl. 6).

Distribution. Atlantic Brazil, specimens seen from Bahia (the epitype), Minas Gerais, and Paraná at 0–240 m elevation, and Velasco Province of Santa Cruz, Bolivia, at 150 m; also reported from Pernambuco (Bureau & Schumann, 1896) and Rio de Janeiro (Schumann, 1897) in Brazil. It is reported to be found in disturbed areas (Fig. 1C).

Phenology. Flowering December to February; fruiting July.

Vellozo published the name *Bignonia falcata* in 1829 with the following diagnosis: “*B. folii conjugates, cirrhosis; foliolis cordatis, pedicellis trifloris; siliqua magna, falcate*” (Vellozo, 1825: 245) and cited tableau 17 in volume 6 of his Icones series. The plate (Vellozo, 1827), reproduced here as Figure 2, depicts a branchlet with a (poorly drawn) racemose panicle with buds, mature flowers, and a mature fruit, as well as a dissected flower and seed. The vegetative characters: the strongly 6-angled stem, bifoliolate

leaves with terminal trifid tendril, and ovate-cordate leaflets with basal palmate venation, as well as the shape and surface of the fruit and overall appearance of the seed, clearly represents the specimens here cited under *Pithecoctenium falcatum*. The flowers are not *Pithecoctenium*. The calyx is small and narrow, the corolla is straight, the stamens are exerted with sagittate anthers, the nectary disc is absent, and the ovary is not differentiated from the style. No Vellozo *Bignonia* specimens have been found (Gentry, 1975b), necessitating lectotypification of the Vellozo names based on the Vellozo Icones plates.

The name *Pithecoctenium cordifolium* was originally published by Martius in 1841 for a species described as having an echinate capsule. He cited a collection from Cujaba, Brazil (*Martius Herbarium Florae Brasiliensis* 516), but also placed *Bignonia squalus* Vell. in synonymy, making his name superfluous and illegitimate. De Candolle (1845) transferred *B. squalus* to *Pithecoctenium*, citing below *P. squalus* (Vell.) DC. “*P. cordifolium* ex parte Mart. herb.” (de Candolle, 1845: 194), and recognizing another collection that Martius had made in São Paulo and identified as *P. cordifolium* as a separate species, which he named *P. cordifolium* DC., a later homonym of the validly published *P. cordifolium* Mart. Bureau and Schumann (1896) placed both *P. cordifolium* Mart. and *P. squalus* DC. in the synonymy of *P. echinatum*. They recognized *P. cordifolium* DC. (as *P. cordifolium* Mart.) as a separate species, which they placed in its own section, *Leiogyne*, based on its glabrous ovary (and pellucid punctate leaflets). Bureau and Schumann had no fruits of this species at this time, but noted both that the Vellozo plate of *B. falcata* depicted without doubt their recognized *P. cordifolium*, “Inter species *Bignoniae* a cl. Vellozo depictas unam invenimus quae fere sine dubitatione pro *Pithecoctenium cordifolio* habendaest, nempe *Bignonia falcata* Vell. Fl. Flum. VI t. 17” (Bureau & Schumann, 1896: 165) and, that if the capsule truly is smooth, the species should be moved to a separate and allied genus. Subsequent to this, Schumann did receive a fruiting specimen from Herrn Neves-Armond, and, in 1897, published the new monotypic genus for this species, *Neves-armondia*, separating it from *Pithecoctenium* based on its glabrous ovary and smooth fruit, and made the new combination *Neves-armondia cordifolia* K. Schum, a nom. nov. for *P. cordifolium* DC. (cited as *P. cordifolia* Mart.). At the same time, Schumann noted that *N. cordifolia* is the same as *B. falcata* illustrated by Vellozo, making *N. cordifolia* superfluous and illegitimate.

In 1975, Gentry (1975b) published an article attempting to account for the names of *Bignonia*

published by Vellozo (1825, 1827). In this, he stated (Gentry, 1975b: 342) “*Bignonia falcata* Vell. (245 (231) t. 17) is almost certainly a mixture based in part on *Neves-armondia cordifolia* (Mart. ex DC.) K. Schum. The vegetative parts and fruit are clearly those of the monotypic *Neves-armondia* but the illustrated flowers are completely different from the *Pithecoctenium*-like flowers of *N. cordifolia*. The probable identification of *B. falcata* with *N. cordifolia* was noted by Bureau and K. Schumann (1896–1897) and by K. Schumann (1897) and *B. falcata* has priority over the basionym of *N. cordifolia* (based on *Pithecoctenium cordifolium* Mart. ex DC., Prodr. 9: 194, 1845). However, in my opinion, the flowers illustrated for *B. falcata* are so dissimilar to those of *N. cordifolia* as to justify rejection of the former under Article 40 as based on a mixture of two or more elements.” There is no provision in the 2006 version of the International Code of Botanical Nomenclature (McNeill et al., 2006) to allow for automatic rejection of *B. falcata* based on a “mixture of two or more elements,” and there seems little justification to propose rejection of this name, which when lectotypified as above, presents no confusion. In addition, as the only other legitimate name published for this taxon, *P. hatschbachii* (published by Gentry, 1979, as a nom. nov. for *P. cordifolia* DC.), has been little used in the botanical literature, the lectotypification of *B. falcata* and new combination *P. falcatum* should cause little disturbance. A flowering specimen, *T. S. dos Santos 574* (MO, with duplicates at CEPEC, NY), is chosen as an epitype to clarify the lectotype, which excludes the flowering portion of t. 17 (Vellozo, 1827). The transfer of *B. falcata* to *Pithecoctenium* is based on its overall vegetative, floral (excluding the glabrous ovary), fruit (excluding surface), and seed similarity to *P. crucigerum*. In addition, Gentry and Tomb (1979) found its pollen to be identical to that of *P. crucigerum*.

Pithecoctenium falcatum is distinguished from *P. crucigerum* by its glabrous ovary and nearly smooth capsule. Racemose paniculate inflorescences and glabrous vegetative parts, while found in specimens of both species, are more commonly present in specimens of *P. falcatum*. However, sterile material, particularly less pubescent specimens, and flowering collections in which the flowers cannot be dissected, cannot be identified with confidence to species.

Additional specimens examined. BOLIVIA. **Santa Cruz:** Velasco Province, carretera al Chore, entre Arroyo de las Londras y Arroyo del Tigre, *M. Peña-Chocarro & L. Arroyo 154* (MO). BRAZIL. s. loc., *A. Glaziou 12972* (C), *11253* (C). **Minas Gerais:** Estação Experimental de Água Limpa, *E. P. Heringer 2231* (NY). **Paraná:** Guaraqueçaba, 20–50 m, *G. Hatschbach 18505* (MO). **São Paulo:** s. loc., *C. Martius s.n.* (M, photo F neg. 20461).

Literature Cited

- Adams, C. D. 1972. Flowering Plants of Jamaica. Robert MacLehose and Company Limited, The University Press, Glasgow.
- Baillon, H. E. 1891 [1888]. Histoire des Plantes. Bignoniacées. 10: 1–78. L. Hachette et Cie, Paris.
- Barrie, F. R. 1991. On the typification of *Bignonia crucigera* L. (Bignoniaceae). Ann. Missouri Bot. Gard. 78: 264–265.
- Bureau, É. 1864. Monographie des Bignoniacées. J.-B. Baillière et fils, Paris.
- & K. Schumann. 1896. Bignoniaceae. i. Pp. 1–230 in C. F. P. von Martius (editor), Flora Brasiliensis, Vol. 8 (2. fasc. 118). Lipsiae apud Fried. Fleischer in Comm., Munich.
- & ———. 1897. Bignoniaceae. ii. Pp. 229–452 in C. F. P. von Martius (editor), Flora Brasiliensis, Vol. 8 (2. fasc. 121). Lipsiae apud Fried. Fleischer in Comm., Munich.
- Burger, W. & A. H. Gentry. 2000. Bignoniaceae. In Flora Costaricensis. Fieldiana, Bot., n.s. 41: 77–162.
- Candolle, A. L. P. P. de. 1845. Bignoniaceae. Pp. 142–248 in A. L. P. P. de Candolle (editor), Prodr. Vol. 9. Sumptus Victoris Masson, Paris.
- . 1874. Calques de dessins de la Flore du Mexique, de Mocino et Sessé qui ont servi de types d'espèces dans le Systema ou le Prodr. Genève.
- Chamisso, A. de. 1832–1833. Bignoniaceae. In Plantis in Expeditione Romanzoffiana. Linnaea 7: 653–723.
- Dodson, C. H. & A. H. Gentry. 1978. Flora of the Río Palenque Science Center. Selbyana 4: 1–xxix, 1–628.
- Fabris, H. A. 1965. Bignoniaceae. In Flora Argentina. Revista Mus. La Plata, Secc. Bot. 9(43): 273–419.
- . 1979. Bignoniaceae. Pp. 504–526 in A. Burkart, Flora Ilustrada de Entre Ríos (Argentina), Vol. 5. ISAG, Colección Científica del I.N.T.A., Buenos Aires.
- Gentry, A. H. 1973a. Generic delimitations of Central American Bignoniaceae. Brittonia 25: 226–242.
- . 1973b [1974]. Bignoniaceae. In R. E. Woodson & R. W. Schery (editors), Flora of Panama. Ann. Missouri Bot. Gard. 60: 781–977.
- . 1974. Studies of Bignoniaceae 11: A synopsis of the genus *Distictis*. Ann. Missouri Bot. Gard. 61: 494–501.
- . 1975a. *Bignonia crucigera*: A case of mistaken identity. Taxon 24: 121–123.
- . 1975b. Identification of Vellozo's Bignoniaceae. Taxon 24: 337–344.
- . 1978. Bignoniaceae. In The botany of the Guayana highlands—part X. Mem. New York Bot. Gard. 29: 245–283.
- . 1979 [1980]. Additional generic mergers in Bignoniaceae. Ann. Missouri Bot. Gard. 66: 778–787.
- . 1980. Bignoniaceae—Part I. Fl. Neotrop. Monogr. 25(1): 1–130.
- . 1982a. Bignoniaceae. Flora de Venezuela 8(4). Fundación de Educación Ambiental, Caracas.
- . 1982b. Bignoniaceae. Flora de Veracruz 24. Instituto Nacional de Investigaciones sobre Recursos Bióticos, Xalapa.
- . 1992. Six new species of Bignoniaceae from upper Amazonia. Novon 2: 159–166.
- . 2001. Bignoniaceae. In W. D. Stevens, C. Ulloa, A. Pool & O. M. Montiel (editors), Flora de Nicaragua. Monogr. Syst. Bot. Missouri Bot. Gard. 85: 103–428.

- & A. S. Tomb. 1979 [1980]. Taxonomic implications of Bignoniaceae palynology. *Ann. Missouri Bot. Gard.* 66: 756–777.
- Gomes, J. C. Jr. 1952 [1953]. Bignoniaceae do ex-herbario Heringer. *Arch. Jard. Bot. Rio de Janeiro* 12: 145–166, pl. 1–6.
- Hassler, E. 1898. Bignoniaceae. *In* R. Chodat, *Plantae Hasslerianae* soit enumeration des plantes récoltées au Paraguay. *Bull. Herb. Boissier* 6 (4, App. 1): 25–28.
- . 1910. Ex herbario Hassleriano: Novitates paraguayensis. X. Bignoniaceae. *Repert. Spec. Nov. Regni Veg.* 9: 49–63.
- Jacquin, N. J. 1760. *Enumeratio Systematica Plantarum Theodorum Haak, Lugduni Batavarum* [Leiden].
- . 1763. *Selectarum Stirpium Americanarum Historia, ex officina Krausiana, Vindobonae* [Wien].
- Klotzsch, J. F. 1848 [1849]. *In* R. Schomburgk (editor), *Reisen in Britisch-Guiana* 3 (in part). Verlagsbuchhandlung von J. J. Weber, Leipzig.
- Lindley, J. 1811. *Bignonia carolinae*, Lady Caroline's Bignonia. *Edwards's Bot. Reg.* 30: 54.
- Loesener, T. 1919. Mexikanische und zentralamerikanische Novitäten. VI. *Repert. Spec. Nov. Regni Veg.* 16: 200–212.
- Machbride, J. F. 1961. Bignoniaceae. *In* *Flora of Peru*. Field Mus. Nat. Hist., Bot. Ser. 13(5c): 3–103.
- Martius, C. F. P. von. 1841. *Herbarium florae brasiliensis*. *Flora* 24 (2, Beibl. 3): 33–48.
- McNeill, J., F. R. Barrie, H. M. Burdet, V. Demoulin, D. L. Hawksworth, K. Marhold, D. H. Nicolson, J. Prado, P. C. Silva, J. E. Skog, J. H. Wiersema & N. J. Turland (editors). 2006. *International Code of Botanical Nomenclature (Vienna Code)*. *Regnum Veg.* 146.
- McVaugh, R. 2000. Botanical Results of the Sessé & Mocino Expedition (1787–1803). VII. A Guide to Relevant Scientific Names of Plants. Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh.
- Meisner, C. F. 1840. *Plantarum Vascularium Genera* 9(1-Tab. Diagn.): 285–312, 9(2-Commentarius): 193–224. Libraria Weidmannia, Leipzig.
- Melchior, H. 1927. Der natürliche Formenkreis der *Pithecocteniinae* innerhalb der Familie der Bignoniaceae. *Repert. Spec. Nov. Regni Veg. Beih.* 46: 71–82.
- Menninger, E. A. 1970. *Flowering Vines of the World*. Hearthsides Press, New York.
- Miers, J. 1863. Report on the plants collected by Mr. Weir, especially the Bignoniaceae. *Proc. Roy. Hort. Soc. London* 3: 179–202.
- Sandwith, N. Y. 1937. Notes on tropical American Bignoniaceae. *Recueil Trav. Bot. Néerl.* 34: 205–232.
- . 1938. Bignoniaceae. Pp. 1–86 *in* A. Pulle, *Flora of Suriname*, Vol. 4(2). J. H. de Bussy Ltd., Amsterdam.
- . 1954a. Contributions to the flora of tropical America: LVI. Further studies in Bignoniaceae. *Kew Bull.* 1953: 451–481.
- . 1954b. Bignoniaceae. Pp. 316–354 *in* *Flora of Trinidad and Tobago*, Vol. 5(2). Government Printer, Port-of-Spain, Trinidad.
- . 1957. Bignoniaceae. *In* *The botany of the Guayana highlands—part II*. *Mem. New York Bot. Gard.* 9(3): 359–366.
- . 1962. Contributions to the flora of tropical America: LXVII. Notes on Bignoniaceae: XXV. Proposed lectotypes of certain genera. *Kew Bull.* 15: 453–457.
- & D. R. Hunt. 1974. Bignoniaceae. Pp. 1–172 *in* P. Raulino Reitz (editor), *Flora Ilustrada Catarinense*, Vol. 1 (Bignon.). Itajaí, Santa Catarina, Brasil.
- Santos, G. dos. 1995. Wood Anatomy, Chloroplast DNA, and Flavonoids of the Tribe Bignonieae (Bignoniaceae). Ph.D. Thesis. The University of Reading, United Kingdom.
- Schumann, K. 1894–1895. Bignoniaceae. Pp. 189–252 *in* A. Engler, *Die natürlichen Pflanzenfamilien*, Vol. 4 (3b). Wilhelm Engelmann, Leipzig.
- . 1897. Bignoniaceae. Pp. 301–304 *in* A. Engler, *Die natürlichen Pflanzenfamilien, Nachträge und Register zu Teil II–IV*, Vol. 1(163). Wilhelm Engelmann, Leipzig.
- Standley, P. C. & L. O. Williams. 1974. Bignoniaceae. *In* *Flora of Guatemala*. *Fieldiana, Bot.* 24(10): 153–232.
- van Steenis, C. G. G. J. 1977. Bignoniaceae. *In* *Flora Malesiana*, ser. I 8(2): 114–186.
- Vellozo, J. M. da Conceição. 1825 [1829]. *Flora Fluminensis*. Aloysii de Vasconcellos & Souza Brasiliensis, Rio de Janeiro.
- . 1827 [1831]. *Flora Fluminensis*, Icones 6. Publicaeque Bibliothecae in Urbe Fluminensi praefectus, Sendefelder, Paris.

APPENDIX 1. Index to Exsiccatae.

Collections are alphabetical by collector name. After the collector's number, the number in parentheses corresponds to the species number in the List of Species. Type collections appear in boldface. All collections cited here were examined by this author as part of this study.

LIST OF SPECIES

1. *Pithecoctenium crucigerum* (L.) A. H. Gentry
2. *Pithecoctenium carolinae* (Lindl.) G. Nicholson
3. *Pithecoctenium dolichoides* (Cham.) Bureau ex K. Schum.
4. *Pithecoctenium falcatum* (Vell.) A. Pool

Acosta 16 (1); *Agra et al.* 5013 (1); *Alboff s.n.* (2); *Alfaro* 1816(1); *Allen* 6467 (1), 6579 (1); *Andrade-Lima* 70-5781 (1); *Andersson s.n.* (1); *Andrieux* **222 (1)**; *Andrieux* 108 (1); *Aplin s.n.* (1); *Araque M. et al.* 19Ar437 (2), 19Ar447 (2); *Araquistain* 2972 (1), 3704 (1); *Arbo* 1555 (2); *Arbo et al.* 6103 (1); *Archer* 4736 (1); *Arechavaleta* 20 (1); *Arenas* 2164 (2), 2397 (2); *Aristeguieta et al.* 6332 (1); *Atwood & Neill* AN138 (1); *Ave-Lallemant s.n.* (R23771) (1).

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Jack 5686 (1); Jacquemin 1931 (1); Janzen 10239 (1), 10965 (1), 12038 (1); Jativa 2966 (2); Jimenez M. 3974 (1); Jiménez & Ramírez 1472 (1); Job 574 (2), 830 (2), 1459 (2); Johnson 280-73 (1); Jones & Facey 3301 (1); Jonker-Verhoef & Jonker 569 (1); Jørgensen 1094 (2), 1969 (2), 3452 (1); Jurgens 5 (1); Jurgensen 230 (1).

Keil & Lehto 6330 (2); Kellerman 5029p.p. (1); Kenoyer s.n. (1); Kenoyer & Crum 3313 (1), 3658p.p. (1); Kiesling 4503 (2); Kiesling et al. 5015 (2); Killeen et al. 4168 (2); King, D. O. 545 (2); King, R. M. 445 (1), 1620 (1); King, R. M. & Diboll 2763 (1); King, R. M. & Soderstrom 4942 (1); Klein 943 (1), 3232 (1), 3292 (1), 3348 (1), 3622 (1), 3741 (1), 3938 (1); Kleinschmidt 14402 (1); Krapovickas & Cristóbal 16514 (2); Krapovickas & Schinini 31845 (1); Krapovickas et al. 19944 (2), 27670 (2); Kullberg s.n. (2); Kummrow 1417 (1), 2094 (1); Kummrow & Stutts 1827 (1); Kunkel, G. 11006 (1); Kunkel, I. 434 (1); Kuntze s.n. (1), Kuntze s.n. (2).

Landrum 3885 (1); Langlassé 1015 (1); Laughlin 868 (1), 1112 (1), 1692p.p. (1), 2025 (1); Legname & Cuezco 10379C (2); Leite 3197 (1); León, Bro. & Roig 11440 (1); Lespedes 5 (1); Liebmann 8027 (1), 8028 (1); Liesner 2546 (1), 4802 (1); Lillo 5246 (1), 6179 (2), 18091 (1), 56973 (1); Iglesias de Lima s.n. (RB58085) (1); Lindberg 153b (1), 156a (1); Lindeman & de Haas 3287 (1), 5420 (1); Löfgren 64 (1); Lohmann 626 (1); Lopez-Palacios 1862 (1); Lopez-Palacios & Bautista B. 3240 (1); Lorence et al. 3817 (1); Lorentz 48 (2), **120 (2)**, 912 (2), 1532 (2); Lossen 28 (2); Lott & Solis Magallanes 1247 (1); Lott et al. 445 (1); Lourteig 2263 (1); Luna, F. E. 31 (2); Luna, M. J. 11 (2); Lund **786 (1)**, Lund s.n. (1); Lundell & Lundell 7336 (1), 7554 (1); Lyonnet 2192 (1), Lyonnet s.n. (1).

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et al. 146 (1); Martínez 782 (1); Martínez S. & Soto N. 1360 (1); Martínez S. & Soto A. 18843 (1); Martínez S. & Téllez 12824 (1); Martino de et al. 831 (1); Martius **408 (4)**, Martius s.n. (4); Mathias 307 (1); Mattos-Silva et al. 1509 (1); Matuda 4405 (1), 4498 (1), 5588 (1), 27911 (1); Maxon et al. 7828 (1); Maxwell 266 (1); McClintock s.n. (2); McCready s.n. (1); McFarlin 5192 (2); McVaugh 14952 (1), 15845 (1), 15897 (1), 22580 (1); McVaugh et al. 1501 (1); de Mello 17A (1), 55 (3); Mexia 4343 (2), 5090 (1), 7245 (1); Meyer 3848 (2), 8345 (2), 8723 (2), 10048 (2), 12753 (2), 13193 (2), 13535 (2), Meyer s.n. (2); Meyer & Sleumer 15264 (2); de Michel 64 (1), 160 (1), 226 (1); Mikan s.n. (1); Miller s.n. (1); Molina R. 190 (1), 862 (1), 14268 (1), 14443 (1); Monetti 12 (2), 103 (2), 1248 (2), 3098 (2); Montalvo 3446 (1); Moore, H. E. 5500 (1); Moore, S. 979 (1); Morales 2928 (1); Morales et al. 1506 (1), 2572 (1); Moreira 87 (1); Morel 381 (2), 418 (2), 920 (2), 1277 (2); Moreno 3144 (1), 4553 (1), 4895 (1), 16237 (1), 16715 (1), 18504 (1), 20014 (1), 22085 (1), 24255 (1), 24270 (1), 24279 (1); Morillo et al. 4243 (1); Morong 158 (1), **749 (1)**; Morrone et al. 1999 (1); Mosén 954 (1); Mueller s.n. (1).

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O'Donell 4223 (2), O'Donell s.n. (2); O'Donell & Rodríguez V. 468 (2), 877 (2); Oersted 19 (1); Oliveira 758 (3); Opler 871 (1), 1767 (1); Ortega, F. 717 (1); Ortega, J. G. 94 (1), 7274 (1); Ortega O., R. 666 (1); Ortiz, B. & Martiniano 162 (1); Ortiz, J. J. 1022 (1); Ousset 107 (2).

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